User's Manual

YHLS Master Module

IM 34M6H46-04E

Applicable Modules:

Model Code	Model Name
F3LH01-1N	YHLS Master Module
F3LH02-1N	YHLS Master Module

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Applicable Product

● Range-free Multi-controller FA-M3

Model code : F3LH0□-1N
Name : YLHS Master Module

The document number and document model code for this manual are given below.

Refer to the document number in all communications; also refer to the document number or the document model code when purchasing additional copies of this manual.

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Document Model Code	:	DOCIM

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Important

■ About This Manual

- This Manual should be passed on to the end user.
- Before using the product, read this manual thoroughly to have a clear understanding of the product.
- This manual explains the functions of this product, but there is no guarantee that they will suit the particular purpose of the user.
- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
- The contents of this manual are subject to change without prior notice.
- Every effort has been made to ensure accuracy in the preparation of this manual. However, should any errors or omissions come to the attention of the user, please contact the nearest Yokogawa Electric representative or sales office.

■ Safety Precautions when Using/Maintaining the Product

- The following safety symbols are used on the product as well as in this manual.

Danger. This symbol on the product indicates that the operator must follow the instructions laid out in this user's manual to avoid the risk of personnel injuries, fatalities, or damage to the instrument. Where indicated by this symbol, the manual describes what special care the operator must exercise to prevent electrical shock or other dangers that may result in injury or the loss of life.

Protective Ground Terminal. Before using the instrument, be sure to ground this terminal.

Function Ground Terminal. Before using the instrument, be sure to ground this terminal.

Alternating current. Indicates alternating current.

Direct current. Indicates direct current.

The following symbols are used only in the user's manual.

WARNING

Indicates a "Warning".

Draws attention to information essential to prevent hardware damage, software damage or system failure.

CAUTION

Indicates a "Caution"

Draws attention to information essential to the understanding of operation and functions.

TIP

Indicates a "TIP"

Gives information that complements the present topic.

SEE ALSO

Indicates a "SEE ALSO" reference.

Identifies a source to which to refer.

- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety stated in this manual whenever handling the product. Take special note that if you handle the product in a manner other than prescribed in these instructions, the protection feature of the product may be damaged or impaired. In such cases, Yokogawa cannot guarantee the quality, performance, function and safety of the product.
- When installing protection and/or safety circuits such as lightning protection devices and equipment for the product and control system as well as designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of processes and lines using the product and the system controlled by it, the user should implement it using devices and equipment, additional to this product.
- If component parts or consumable are to be replaced, be sure to use parts specified by Yokogawa.
- This product is not designed or manufactured to be used in critical applications which directly affect or threaten human lives and safety — such as nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities or medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
- Do not attempt to modify the product.

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- Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa Electric) makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
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■ General Requirements for Using the FA-M3 Controller

● Avoid installing the FA-M3 controller in the following locations:

- Where the instrument will be exposed to direct sunlight, or where the operating temperature exceeds the range 0°C to 55°C (32°F to 131°F).
- Where the relative humidity is outside the range 10% to 90%, or where sudden temperature changes may occur and cause condensation.
- Where corrosive or flammable gases are present.
- Where the instrument will be exposed to direct mechanical vibration or shock.
- Where the instrument may be exposed to extreme levels of radioactivity.

● Use the correct types of wire for external wiring:

- Use copper wire with temperature ratings greater than 75°C (167°F).

● Securely tighten screws:

- Securely tighten module mounting screws and terminal screws to avoid problems such as faulty operation.
- Tighten terminal block screws with the correct tightening torque as given in this manual.

● Securely lock connecting cables:

- Securely lock the connectors of cables, and check them thoroughly before turning on the power.

● Interlock with emergency-stop circuitry using external relays:

- Equipment incorporating the FA-M3 controller must be furnished with emergency-stop circuitry that uses external relays. This circuitry should be set up to interlock correctly with controller status (stop/run).

● Ground for low impedance:

- For safety reasons, connect the [FG] grounding terminal to a Japanese Industrial Standards (JIS) Class D (earlier called Class 3) Ground[*1]. For compliance to CE Marking, use braided or other wires that can ensure low impedance even at high frequencies for grounding.

*1 Japanese Industrial Standard (JIS) Class D Ground means grounding resistance of 100 Ω max.

● Configure and route cables with noise control considerations:

- Perform installation and wiring that segregates system parts that may likely become noise sources and system parts that are susceptible to noise. Segregation can be achieved by measures such as segregating by distance, installing a filter or segregating the grounding system.

● Configure for CE Marking Conformance:

- For compliance to CE Marking, perform installation and cable routing according to the description on compliance to CE Marking in the “Hardware Manual” (IM34M6C11-01E).

- **Keep spare parts on hand:**
  - Stock up on maintenance parts including spare modules, in advance.

- **Discharge static electricity before operating the system:**
  - Because static charge can accumulate in dry conditions, first touch grounded metal to discharge any static electricity before touching the system.

- **Never use solvents such as paint thinner for cleaning:**
  - Gently clean the surfaces of the FA-M3 controller with a cloth that has been soaked in water or a neutral detergent and wringed.
  - Do not use volatile solvents such as benzine or paint thinner or chemicals for cleaning, as they may cause deformity, discoloration, or malfunctioning.

- **Avoid storing the FA-M3 controller in places with high temperature or humidity:**
  - Since the CPU module has a built-in battery, avoid storage in places with high temperature or humidity.
  - Since the service life of the battery is drastically reduced by exposure to high temperatures, take special care (storage temperature should be from -20°C to 75°C (-4°F to 167°F)).
  - There is a built-in lithium battery in a CPU module and temperature control module which serves as backup power supply for programs, device information and configuration information. The service life of this battery is more than 10 years in standby mode at room temperature. Take note that the service life of the battery may be shortened when installed or stored at locations of extreme low or high temperatures. Therefore, we recommend that modules with built-in batteries be stored at room temperature.

- **Always turn off the power before installing or removing modules:**
  - Failing to turn off the power supply when installing or removing modules, may result in damage.

- **Do not touch components in the module:**
  - In some modules you can remove the right-side cover and install ROM packs or change switch settings. While doing this, do not touch any components on the printed-circuit board, otherwise components may be damaged and modules may fail to work.

- **Do not use unused terminals:**
  - Do not connect wires to unused terminals on a terminal block or in a connector. Doing so may adversely affect the functions of the module.

■ Waste Electrical and Electronic Equipment

Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC
(This directive is only valid in the EU.)

This product complies with the WEEE Directive (2002/96/EC) marking requirement.
The following marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category
With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a “Monitoring and Control instrumentation” product.
Do not dispose in domestic household waste.
When disposing products in the EU, contact your local Yokogawa Europe B. V. office.

Introduction

■ Overview of the Manual

This manual describes the specifications, operations, and communications protocol of the YHLS (Yokogawa High-speed Link System) master module F3LH0□-1N.

■ Related User's Manuals

For individual sequence CPU modules, read the latest versions of the relevant user's manuals as required.

● F3SP66, F3SP67 functions

- Sequence CPU – Functions (for F3SP66-4S, F3SP67-6S) (IM34M6P14-01E)
- Sequence CPU – Network Communication Functions (for F3SP66-4S, F3SP67-6S) (IM34M6P14-02E)

● F3SP28, F3SP38, F3SP53, F3SP58, or F3SP59 functions

- Sequence CPU – Functions (for F3SP28-3N/3S, F3SP38-6N/6S, F3SP53-4H/4S, F3SP58-6H/6S, F3SP59-7S) (IM34M6P13-01E)

● F3SP21, F3SP25, F3SP35, F3SP05, or F3SP08 functions

- Sequence CPU – Functions (for F3SP21, F3SP25, and F3SP35) (IM34M6P12-02E)

The following user's manuals are common to all sequence CPUs.

● Instructions

- Sequence CPU – Instructions (IM34M6P12-03E)

● Ladder programming

- FA-M3 Programming Tool WideField2 (IM34M6Q15-01E)

For the FA-M3 specifications and configurations[*1], installation and wiring, test run, maintenance, and module installation restrictions, refer to:

*1: Refer to the relevant product manuals for specifications except for power supply modules, base modules, input/output modules, cables and terminal units.

● All sequence CPU modules

- Hardware Manual (IM34M6C11-01E)

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FA-M3
YHLS Master Module

IM 34M6H46-04E 1st Edition

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1. Overview

The Yokogawa High-speed Link System (YHLS) master module F3LH01-1N has one YHLS master interface port, while the F3LH02-1N has two master interface ports for connecting slave units to perform remote I/O.

Table 1.1 Applicable Module

Model Code	Module Name	Description
F3LH01-1N	YHLS Master Module	One YHLS port
F3LH02-1N	YHLS Master Module	Two YHLS ports

1.1 What is YHLS?

Yokogawa High-speed Link System (YHLS) is designed for implementing high-speed remote I/O in the FA-M3 system.

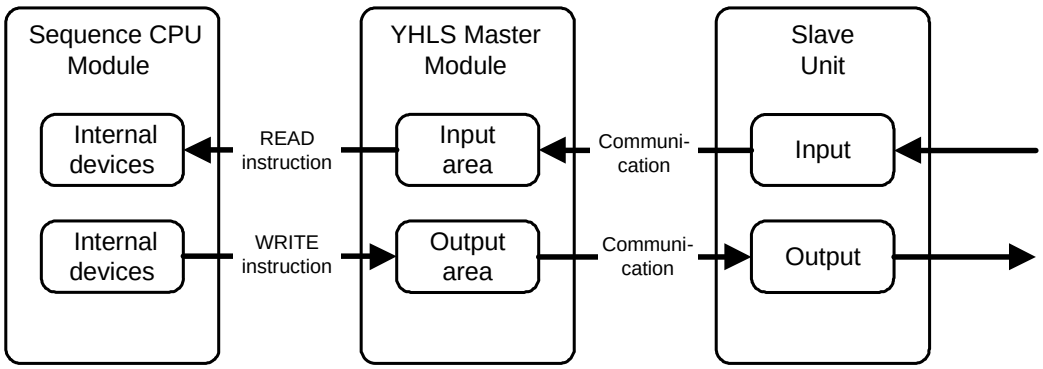
A YHLS system consists of the FA-M3 master module (F3LH0□-1N) connected to multiple distributed slave units through a communication cable to allow high-speed control of remote I/O units from a sequence CPU. It has the following merits:

- High-speed scan of 63 slave units in just 0.96 ms.
- Reduced wiring through use of distributed devices within a system
- Simple mechanism for high-speed exchange of ON/OFF signals and numerical data with remote devices
- Adoption of the HLS open network allows flexibility in building customized application systems by connecting HLS-compliant I/O units from different vendors.

1.2 Features of YHLS

1.2.1 Communications between YHLS Master Module and Slave Units

Through periodic communications with connected slave units, the YHLS master module acquires ON/OFF information of switches connected to these slave units into its input data area, as well as outputs information stored in its output data area as ON/OFF information for actuators. By accessing the I/O data areas of the YHLS master module using READ and WRITE instructions, the sequence CPU module can thus exchange information with field equipment.



1.2.2 Constant Communication Cycle Time

YHLS features a constant communication cycle time, not affected by automatic participation or withdrawal of slave units, thus delivering reliable communications with constant cycle time under all circumstances.

1.2.3 Output Control Function

The YHLS master module can be made to suspend YHLS communications when the sequence CPU module “stops”. By combining this feature with output control functions of individual slave units, which can be used to reset or hold the contact outputs of individual slave units when YHLS communication stops, you can implement output control of the entire YHLS system when sequence stops.

1.2.4 Daisy-chain Connection

As YHLS adopts a daisy-chain connection inside each communication connector, a slave unit that is powered off or down does not affect normal communication with the other slaves.

1.2.5 Transmission Line Quality Indicators

The YHLS master module indicates transmission line quality using its L (LINK) LED and A (ALARM) LED. It also stores transmission line quality status information in its internal registers.

2. Specifications

2.1 Standard Specifications

■ Model and Suffix Codes

Model	Suffix Code	Style Code	Option Code	Description
F3LH01	-1N	……	……	12 Mbps max., 1 YHLS port
F3LH02	-1N	……	……	12 Mbps max., 2 YHLS ports

■ Operating Environment

There is no restriction on the type of CPU module that can be used with the F3LH0□-1N module.

■ General Specifications

Item	Specifications
Operating ambient temperature	0 to 55°C
Operating ambient humidity	10 to 90% RH (non-condensing)
Operating ambient atmosphere	Must of free of corrosive gases, flammable gases and heavy dust
Storage ambient temperature	-20 to 75°C
Storage ambient humidity	10 to 90% RH (non-condensing)

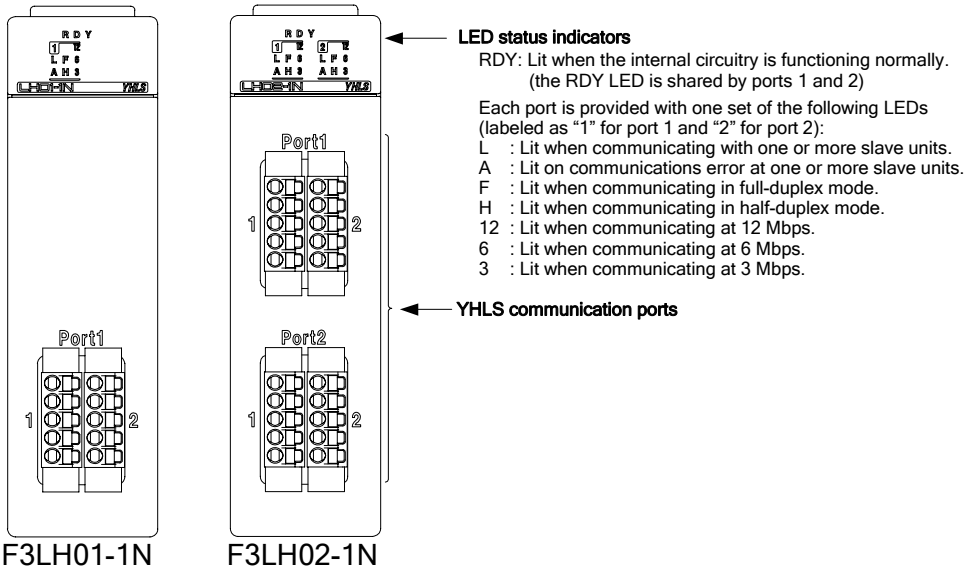
■ Performance Specifications

Item	Specifications	
	F3LH01-1N	F3LH02-1N
Communications mode	4-wire full-duplex or 2-wire half-duplex	
Transmission speed	3 Mbps, 6 Mbps or 12 Mbps	
Transmission format	HLS compliant	
Synchronization	Bit synchronization	
Transmission distance	300 m (at 3 Mbps), 200 m (at 6 Mbps), or 100 m (at 12 Mbps)	
Error detection	CRC-12	
Number of ports	1	2
Number of connectors	2	4
Max. number of slaves per module	63*1 (32 per connector)	126*1 (32 per connector)
Number of I/O points per module	1008 inputs 1008 outputs	2016 inputs 2016 outputs
Impedance	100 Ω	
Terminating resistor	Internal*2	
Connector type	European type	
Recommended communication cable	KM80 and KM81	
RAS functions	- Automatic slave unit participation - Reset/hold outputs when CPU stops - Network quality monitoring	
Current consumption	360 mA at 5 VDC	480 mA at 5 VDC
External dimensions	28.9 (W) x 100 (H) x 83.2 (D) mm*3	
Weight	100 g	105 g

*1: One connector can connect up to 32 slave units (one port supports up to 63 slave units). To connect 63 slave units, connect 32 slaves to one connector 31 slaves to the other connector.
*2: The module has a built-in terminating resistor, which must be enabled for terminal stations (the farthest module on a communication line) of the I/O system.
*3: Excluding protrusions (see External Dimensions for details).

■ Components and Functions

● Front View



F3LH01-1N F3LH02-1N

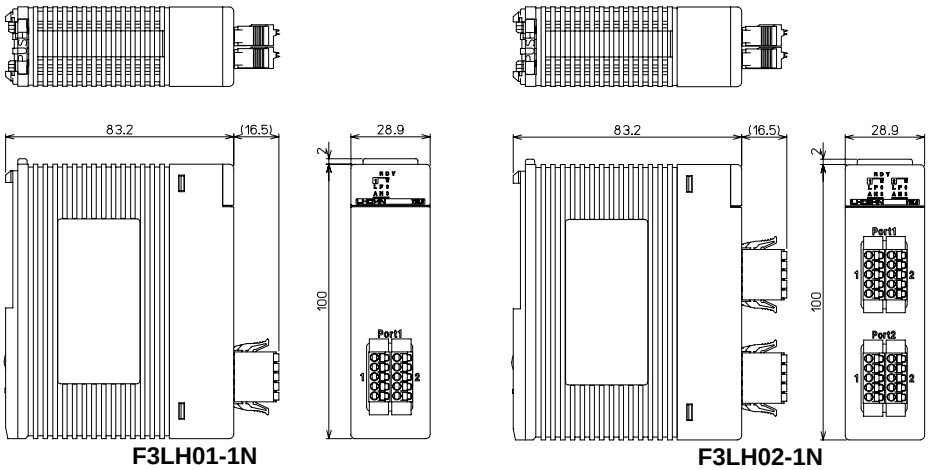
● LED Indicators

Designation (color)	Description	When Lit	When Not Lit
RDY (green)	Internal circuit status	Normal	Error
L (green)	Communications status (LINK)	Communicating with one or more slave units.	Not communicating with slave units.
A (yellow)	Communications error (ALARM)	Communication failure has been detected at one or more slave units.	No communication failure has been detected at any slave unit or no communication has occurred yet.
F/H (red)	Communications mode	Indicates communications mode when Request to Communicate relay is ON. F: full duplex; H: half duplex	No indication when Request to Communicate relay is OFF.
12/6/3 (red)	Transmission speed	Indicates transmission speed when Request to Communicate relay is ON. 12: 12 Mbps, 6: 6 Mbps, and 3: 3 Mbps	No indication when Request to Communicate relay is OFF.

* For details on how to interpret combinations of LED indicators, see Chapter 8, "Troubleshooting."

■ External Dimensions

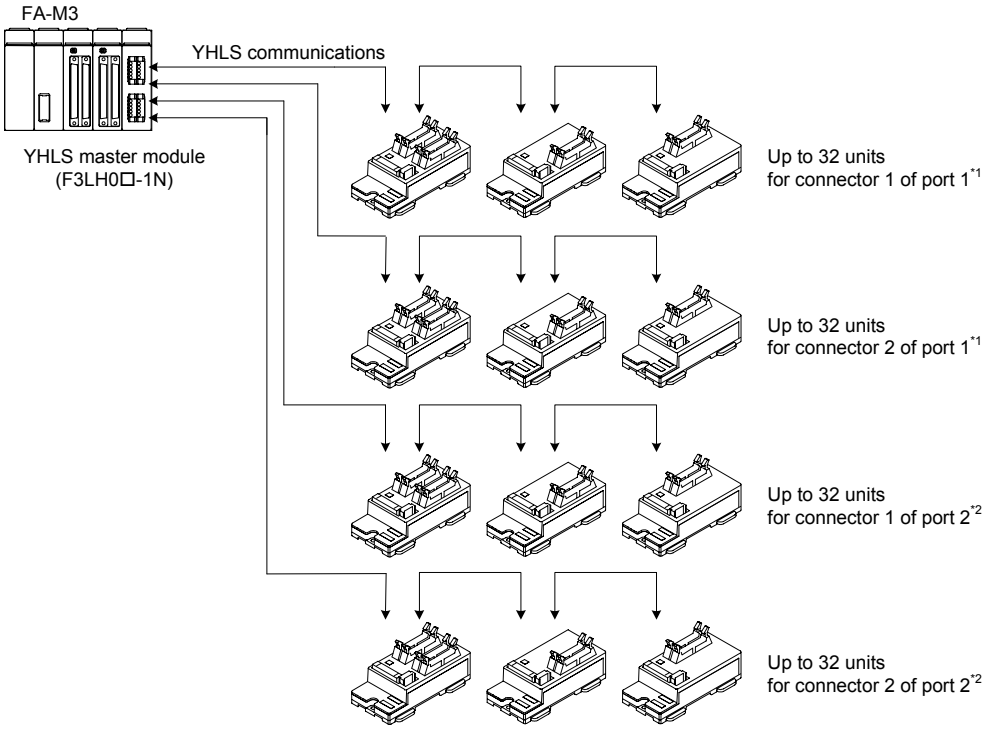
(Unit: mm)



F3LH01-1N **F3LH02-1N**

2.2 External Connection

■ Connection Topology



■ Connector Pin Assignment

Use straight connection type cables for master-slave, as well as slave-slave connections.

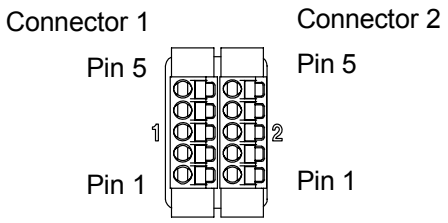


Figure 2.1 Front View of Module Connectors

Connector of Each Port	Pin No.	Full-duplex Communications			Half-duplex Communications		
		Signal Symbol	Signal Flow		Signal Symbol	Signal Flow	
			Master	Slave		Master	Slave
Connector 1	5	TxD-	→		NC	—	
	4	TxD+	→		NC	—	
	3	RxD-	←		TRD-	←→	
	2	RxD+	←		TRD+	←→	
	1	SHIELD	←→		SHIELD	←→	
Connector 2	5	TxD-	→		NC	—	
	4	TxD+	→		NC	—	
	3	RxD-	←		TRD-	←→	
	2	RxD+	←		TRD+	←→	
	1	SHIELD	←→		SHIELD	←→	

■ Cable

Prepare and use cables, taking into consideration the connector pin assignments.
We recommend using the cables listed below.

● Recommended cables

KM80 (YHLS fixed cable）
KM81 (YHLS flexible cable)

CAUTION

Not using KM8☐ cables may result in sub-optimal performance.

■ Connector

The module comes with connector(s). If required, you may use the following type of connector:

- FMC 1,5/5-ST-3,5-RF from Phoenix Contact

■ Shield Treatment

The cable shield must be treated as follows:

- The drain wire of the cable must be connected to pin 1 of FMC 1,5/5-ST-3,5-RF.

CAUTION

The cable shield of the YHLS communication line is connected to the base module (F3BU☐☐-☐☐) through pin 1 of a communication connector of the module. Therefore, you can increase the noise immunity of the YHLS communication line by gounding (JIS class-D grounding) the base module or the FG terminal of the power supply module (F3PU☐☐-☐☐).

■ Pin Terminals

We recommend attaching pin terminals at the end of cable wires before connection to the connector of the module. The following pin terminals can be used:

- AI 0,34-8 TQ from Phoenix Contact
- AI 0,5-10 WH from Phoenix Contact

2.3 Attaching/Detaching the Module

■ Attaching the Module

Figure 2.2 shows how to attach this module to the base module. First hook the anchor slot at the bottom of the module to be attached onto the anchor pin on the bottom of the base module. Push the top of the module toward the base module until the yellow anchor/release button clicks into place.

CAUTION

Always switch off the power before attaching or detaching the module.

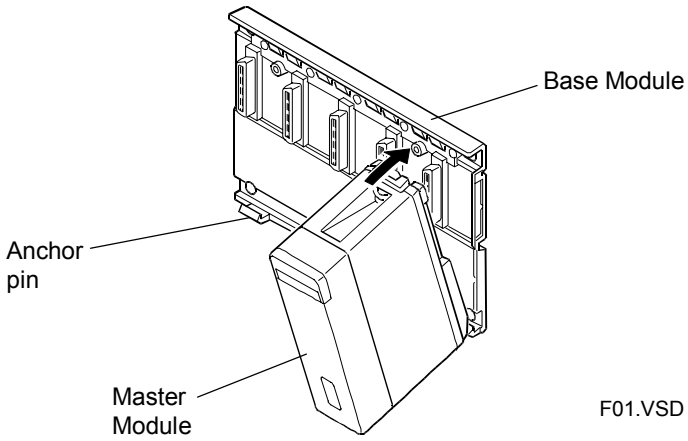


Figure 2.2 Attaching/Detaching the Module

CAUTION

Do not bend the connector on the rear of the module by force during the above operation. If the module is pushed with improper force, the connector may bend causing an error.

■ Detaching the Module

To remove this module from the base module, reverse the above operation.

Press the yellow anchor/release button on the top of this module to unlock it and tilt the module away from the base module.

■ Attaching the Module in Intense Vibration Environments

If the module is used in intense vibration environments, fasten the module with a screw.

Use screws of type listed in the table below.

Insert these screws into the screw holes on top of the module and tighten them with a Phillips screwdriver.

Required Screw
M4-size binder screw 12 to 15 mm long (or 14-15 mm long if fitted with a washer)

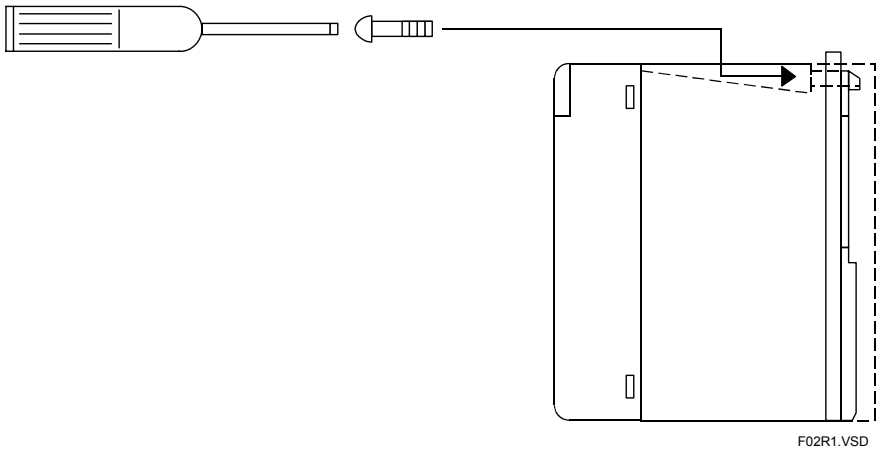


Figure 2.3 Securing Module Using Screws

3. Functions

This chapter describes the functions of the YHLS master module.

3.1 List of Functions

Table 3.1 List of Functions

Functions	Description	See Section:
Communication with slave units	I/O communication with slave units for ON/OFF control and monitoring.	3.2
Constant communication cycle time	The YHLS features a constant communication cycle time, which is not affected by automatic withdrawal or participation of slave units. A slave unit that is unavailable for communication due to power off or any other reason is withdrawn from scanning and communication continues with the remaining normal slave units. When the slave unit recovers, it automatically resumes communications with the YHLS master module.	3.3
Output control function	This function can be used to suspend communications of the master module with slave units when the sequence CPU module enters STOP mode.	3.4
Transmission line quality indicators	The YHLS master module indicates transmission line quality using its L (LINK) LED and A (ALARM) LED. A program can also check the transmission line quality using internal registers of the YHLS master module.	3.5

3.2 Communication with Slave Units

3.2.1 Starting Communications

After setting the transmission speed, communications mode, the slave unit last address, and various registers as required, turn on the Request to Communicate relay start communication between the YHLS master module and the slave units.

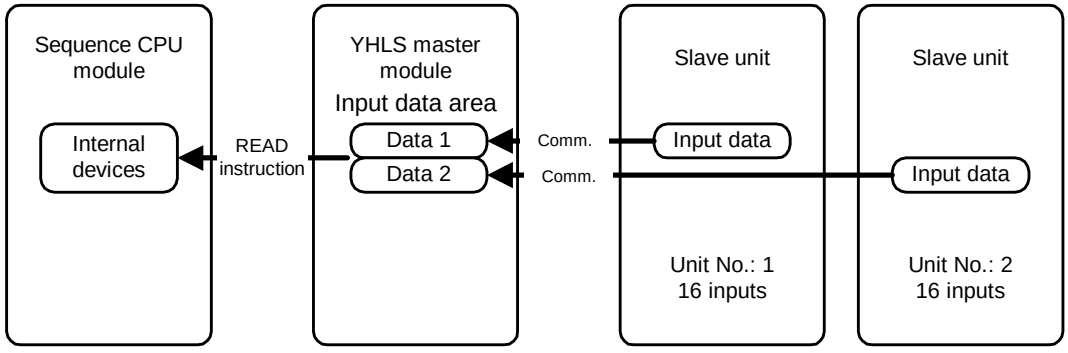
CAUTION

Changes to the transmission speed, communications mode, last address and some other settings are applied when the Request to Communicate relay is turned on. Changing these settings while the Request to Communicate relay is on has no effect.

3.2.2 Input

Input statuses of slave units are transmitted to the YHLS master module and stored in its input area according to slave unit number during a communication cycle.

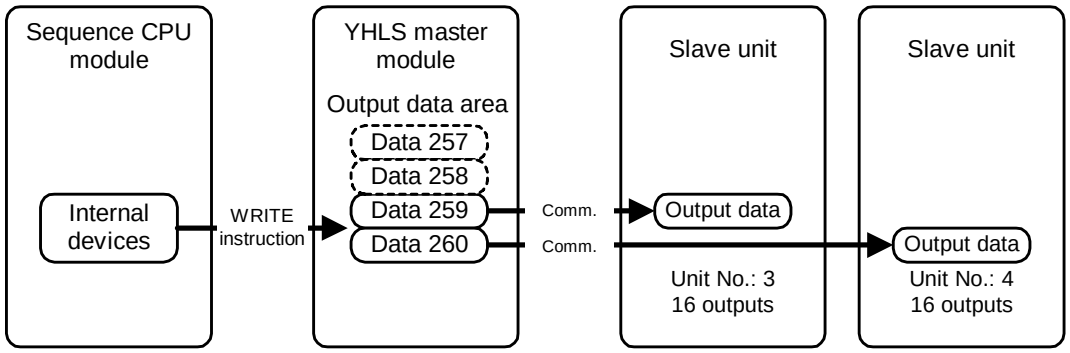
The sequence CPU module then issues a read instruction at its own timing to read the input status of a slave unit from the input area of the YHLS master module into its internal device.



3.2.3 Output

The sequence CPU module issues a write instruction to store the data of its internal device to the output area of the YHLS master module.

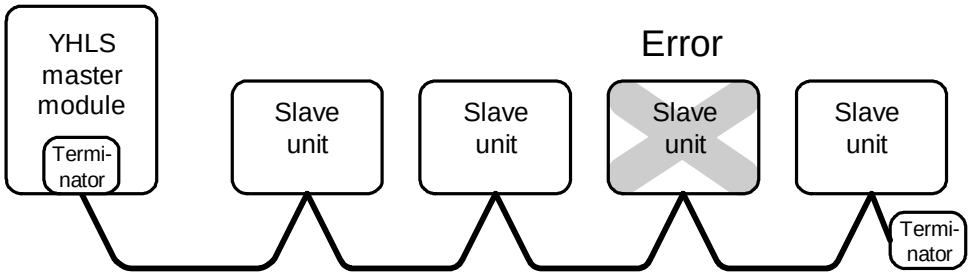
Data stored in data positions corresponding to each slave unit number within the output area of the YHLS master module is transmitted to the respective slave units during a communication cycle.



3.3 Constant Communication Cycle Time

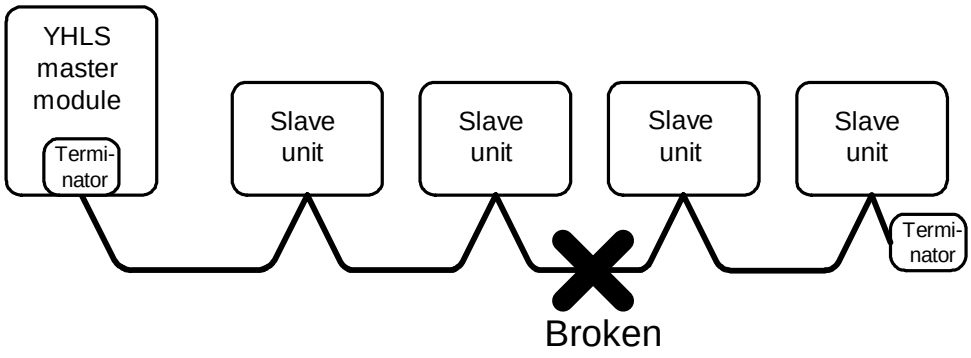
3.3.1 When a Slave Unit is Withdrawn from Communication

Slave units that are no longer available for communication due to power off or other reasons are withdrawn from YHLS communication but communication continues with the remaining normal slave units. Although there is no response for accesses to withdrawn slave units, remote scan time remains constant as no retries are attempted.



CAUTION

If a communication cable is broken, communication fails due to YHLS communication line instability caused by the loss of the terminating resistor.



3.3.2 When a Slave Unit Resumes Communication

When a slave unit that was unavailable due to power off or any other reason recovers, it automatically resumes communication with the YHLS master module. Automatic participation by a slave unit does not prolong the remote scan time.

3.4 Output Control Function

This function is used to suspend communications of the YHLS master module with slave units when the sequence CPU module “stops”.

To enable this function, set the “Output when Stopped” setting to ‘Reset’ in the DIO setup for the slot installed with the F3LH0□-1N master module in the configuration setup of the CPU module.

The states of the contact outputs (reset or hold) of an individual slave unit when the YHLS master module suspends communication depend on the configuration of the slave unit.

SEE ALSO

For details on the sequence CPU module configuration, see:

- Sequence CPU User’s Manual - Functions (IM34M6P13-01E)
  Section 1.2.3, Configuration
  Chapter 8, RAS Features
- FA-M3 Programming Tool WideField2 (IM34M6Q15-01E)
  Section B7.1.3, Configuration Setup

CAUTION

In the event of a moderate or fatal failure of the sequence CPU module, the YHLS master module stops communications with slave units.
The status of the contact outputs of an individual slave unit when the master module suspends communications can be specified using the Reset/Hold setting of the slave unit.

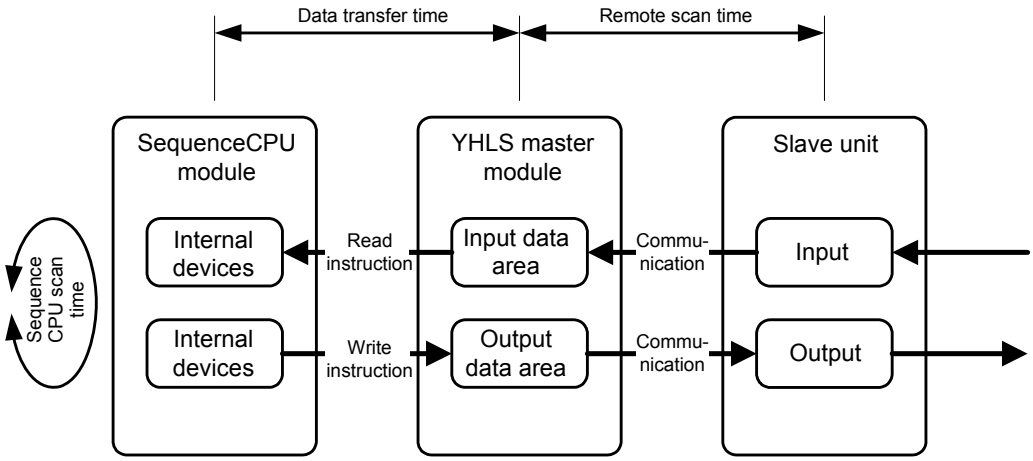
3.5 Transmission Line Quality Indicators

Each YHLS unit has “L” and “A” LED indicators that indicates the transmission line quality. “L” denotes “LINK”, while “A” denotes “ALARM.”

The YHLS master module also provides internal registers, which can be used by a program for checking transmission line quality. For details, see Chapter 7, "List of Registers."

4. Response Time

This chapter describes the response time of a remote I/O system.



4.1 Data Transfer Time

● Data transfer from YHLS master module to Sequence CPU module

Data stored in the input area of the YHLS master module is transferred to internal devices of the sequence CPU module by execution of a READ instruction.

The instruction execution time depends on the sequence CPU type. Moreover, for some sequence CPU types, data transfer time is significantly reduced when the master module is installed in the main unit instead of a sub-unit.

Table 4.2 Data Transfer Time from YHLS Master Module to Sequence CPU Module

	No. of words transferred	F3SP05 F3SP08 F3SP21	F3SP28 F3SP38	F3SP53 F3SP58 F3SP59 F3SP66 F3SP67
When master module is installed in the main unit	1	250 µs	17 µs	13 µs
	16	470 µs	23 µs	21 µs
	63	690 µs	35 µs	29 µs
When master module is installed in a sub-unit	1	260 µs	27 µs	20 µs
	16	460 µs	220 µs	200 µs
	63	1.2 ms	790 µs	760 µs

● Data transfer from sequence CPU module to YHLS master module

Data stored in internal devices of the sequence CPU module is transferred to the output area of the YHLS master module by execution of a WRITE instruction.

The instruction execution time depends on the sequence CPU type. Moreover, for some sequence CPU types, data transfer time is significantly reduced when the master module is installed in the main unit instead of a sub-unit.

Table 4.1 Data Transfer Time from Sequence CPU Module to YHLS Master Module

	No. of words transferred	F3SP05 F3SP08 F3SP21	F3SP28 F3SP38	F3SP53 F3SP58 F3SP59 F3SP66 F3SP67
When master module is installed in the main unit	1	240 µs	17 µs	12 µs
	16	350 µs	21 µs	15 µs
	63	670 µs	33 µs	27 µs
When master module is installed in a sub-unit	1	250 µs	25 µs	18 µs
	16	450 µs	220 µs	210 µs
	63	1.2 ms	800 µs	770 µs

CAUTION

- The data transfer time varies with the system configuration and the user program.
- The data transfer time varies with the sequence CPU type used.
- The data transfer time is different when the YHLS master module is installed in a sub-unit instead of the main unit.
- When using the F3SP28, F3SP38, F3SP53, F3SP58, F3SP59, F3SP66 or F3SP67 sequence CPU, you can shorten the data transfer time by installing the YHLS master module in the main unit instead of a sub-unit.

4.2 Remote Scan time (RST)

Remote scan time is the time required by the YHLS master module to update the data of all slave units.

The remote scan time can be computed using the communications mode (full-duplex or half-duplex), transmission speed, and last address of slave units as shown below.

● RST for full-duplex communication

RST = 182 x FA x Tbps (s)

RST	:	Remote scan time
182	:	Constant
FA	:	Slave unit last address
Tbps	:	1/transmission speed

Calculation example:

Suppose that 8 slave units are connected for communication at 12 Mbps.

FA	:	Slave unit last address = 8
Tbps	:	1/transmission speed = 1/12 Mbps = 0.083×10^{-6}

Thus, RST = $182 \times 8 \times 0.083 \times 10^{-6}$

= 121.3×10^{-6} (s)

● RST for half-duplex communication

RST = 354 x FA x Tbps (s)

RST	:	Remote scan time
354	:	Constant
FA	:	Slave unit last address
Tbps	:	1/transmission speed

Calculation example:

Suppose that 16 slave units are connected for communication at 6 Mbps.

FA	:	Slave unit last address = 16
Tbps	:	1/transmission speed = 1/6 Mbps = 0.167×10^{-6}

Thus, RST = $354 \times 16 \times 0.167 \times 10^{-6}$

= 944×10^{-6} (s)

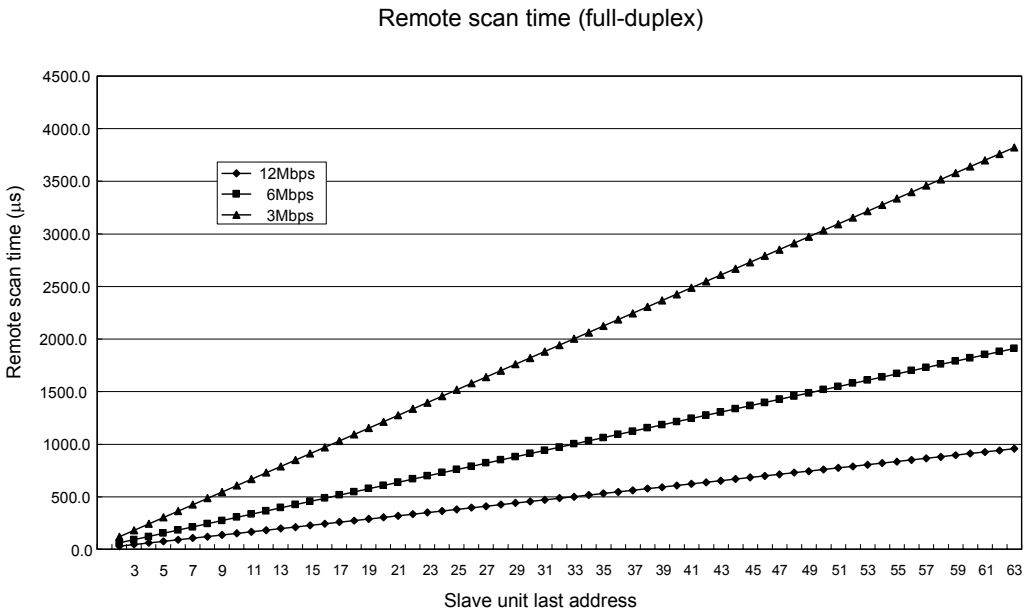


Fig. 4.1 Remote Scan time (for full-duplex communication, slave unit last address: 2 to 63)

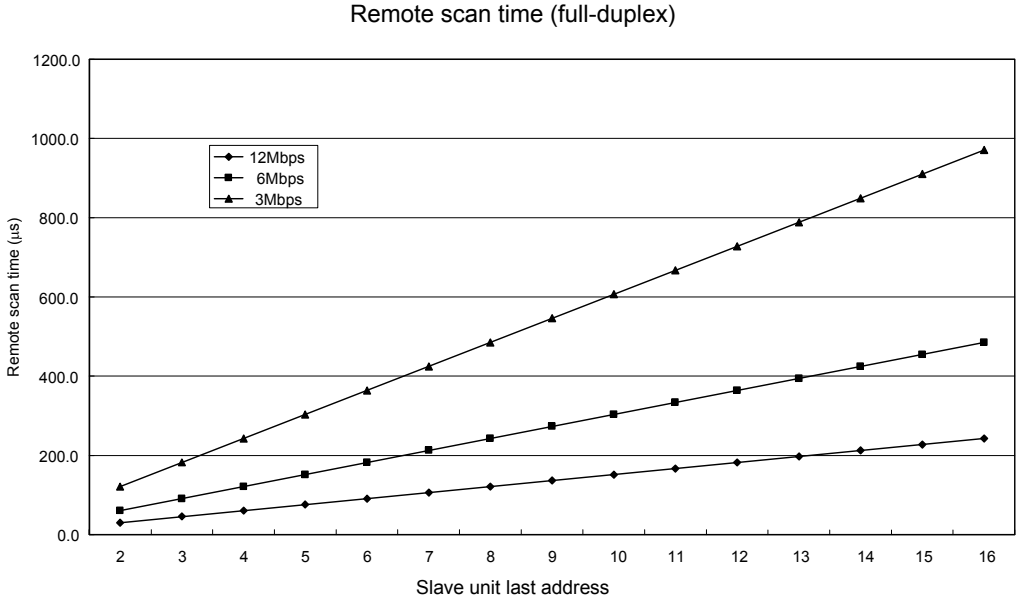
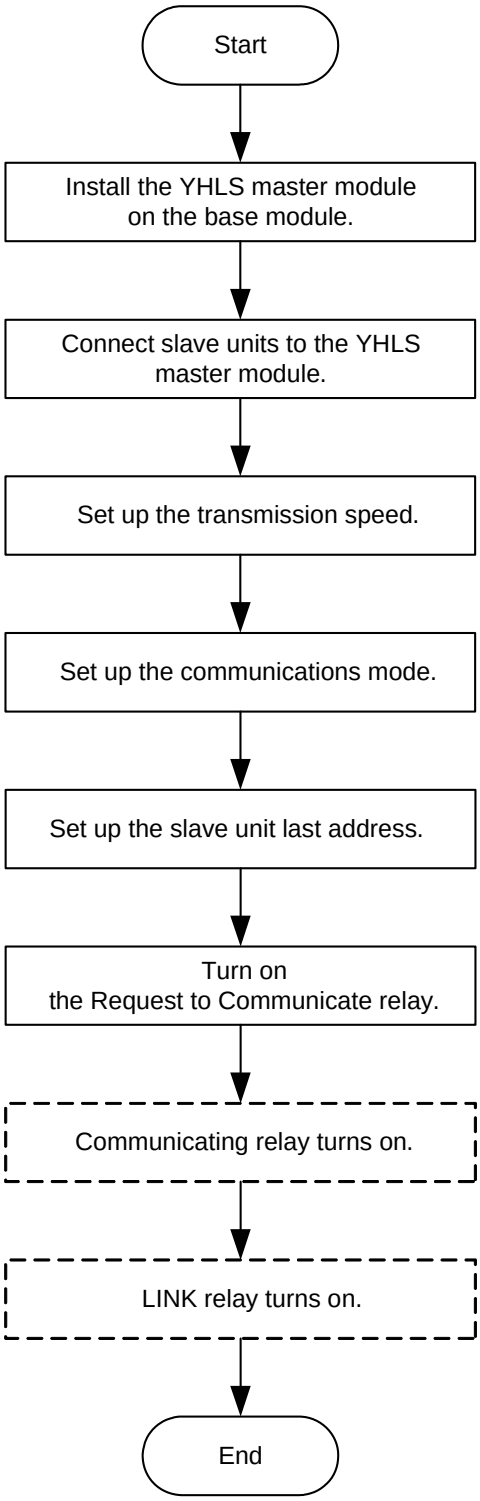


Fig. 4.2 Remote Scan time (for full-duplex communication, slave unit last address: 2 to 16)

5. Communication Preparation Flow

The following flowchart shows how to prepare for communications.



See Section 2.3, "Attaching/Detaching the Module."

See Section 2.2, "External Connection."

See Section 7.3, "Parameter Setup Area."

See Section 7.3, "Parameter Setup Area."

See Section 7.3, "Parameter Setup Area."

See Chapter 6, "List of I/O Relays."

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6. List of I/O Relays

The YHLS master module has 32 input and 32 output relays for interfacing with the FA-M3 sequence CPU module. Each of the input relays can be configured to raise an interrupt.

6.1 Output Relays

Table 6.1 Output Relays

Output Relay Number	Output Relay Name	Description
Y□□□33	Request to Communicate relay*1	Turn on this relay to start communication. Once communication is started, input relay X□□□01 (Communicating relay) turns on. Turn off this relay to stop communication.
Y□□□34 to Y□□□40	Reserved	
Y□□□41	Request to Communicate relay*2	Turn on this relay to start communication. Once communication is started, input relay X□□□09 (Communicating relay) turns on. Turn off this relay to stop communication.
Y□□□42 to Y□□□64	Reserved	

*1 : For port 1

*2 : For port 2

□□□ : Slot number

6.2 Input Relays

Table 6.2 Input Relays

Input Relay Number	Input Relay Name	Description
X□□□01	Communicating*1	Turns on when communication is started by Y□□□33. Turns off when Y□□□33 is turned off.
X□□□02	Link*1	Turns on when communication is started if one or more slave units are available for communication. Turns off when Y□□□33 is turned off.
X□□□03	Alarm*1	Turns on when one or more slave units that were previously available for communication are no longer available. Turns off when Y□□□33 is turned off or when there is no failed slave unit.
X□□□04 to X□□□08	Reserved	
X□□□09	Communicating*2	Turns on when communication is started by Y□□□41. Turns off when Y□□□41 is turned off.
X□□□10	Link*2	Turns on when communication is started if one or more slave units are available for communication. Turns off when Y□□□41 is turned off.
X□□□11	Alarm*2	Turns on when one or more slave units that were previously available for communication are no longer available. Turns off when Y□□□41 is turned off or when there is no failed slave unit.
X□□□12 to X□□□32	Reserved	

*1 : For port 1

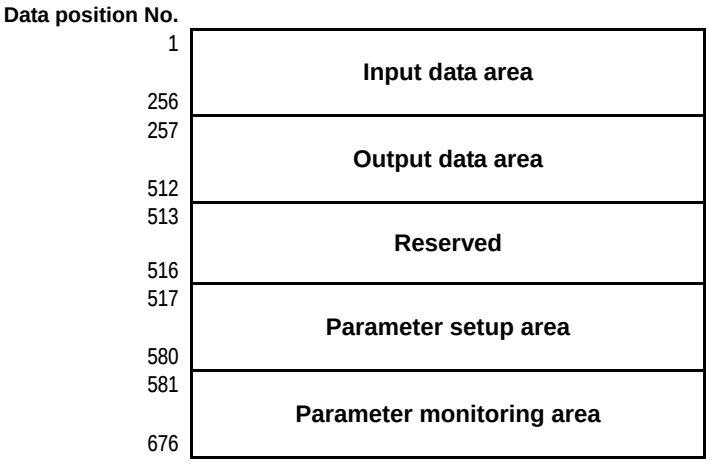
*2 : For port 2

□□□ : Slot number

7. List of Registers

Registers of the YHLS master module are grouped into the following four areas:

Input data area	: For storing data read from slave units
Output data area	: For storing data to be written to slave units
Parameter setup area	: For YHLS parameter setup
Parameter monitoring area	: For YHLS parameter monitoring



7.1 Input Data Area

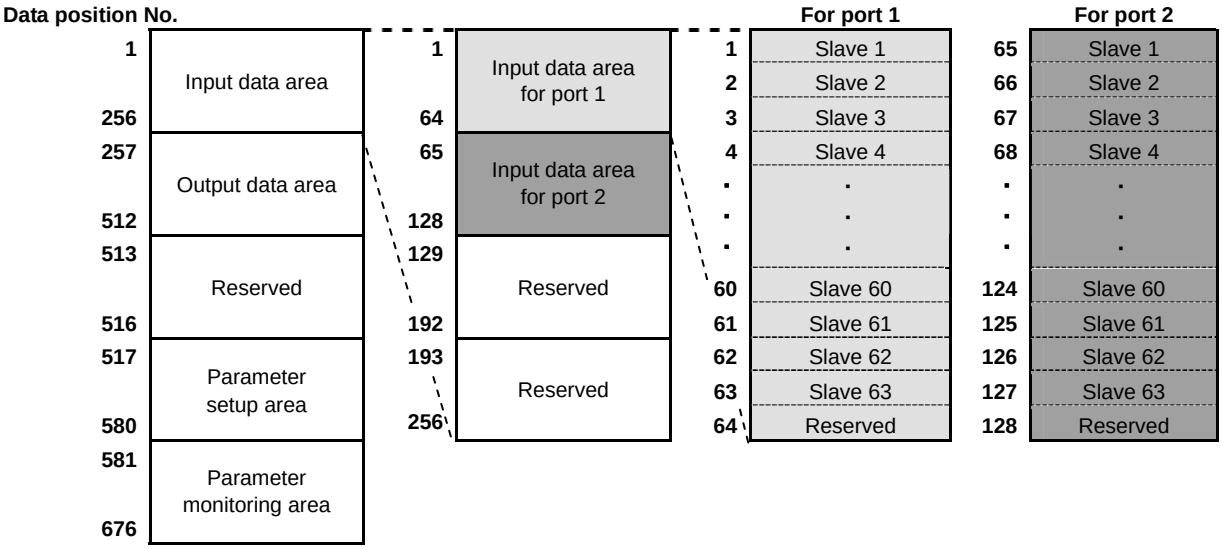


Table 7.1 Mapping between Data Position No. and Slave Addresses for Input Data of Port 1

Data position No.	Slave Address	Data position No.	Slave Address	Data position No.	Slave Address	Data position No.	Slave Address
1	Slave 1	17	Slave 17	33	Slave 33	49	Slave 49
2	Slave 2	18	Slave 18	34	Slave 34	50	Slave 50
3	Slave 3	19	Slave 19	35	Slave 35	51	Slave 51
4	Slave 4	20	Slave 20	36	Slave 36	52	Slave 52
5	Slave 5	21	Slave 21	37	Slave 37	53	Slave 53
6	Slave 6	22	Slave 22	38	Slave 38	54	Slave 54
7	Slave 7	23	Slave 23	39	Slave 39	55	Slave 55
8	Slave 8	24	Slave 24	40	Slave 40	56	Slave 56
9	Slave 9	25	Slave 25	41	Slave 41	57	Slave 57
10	Slave 10	26	Slave 26	42	Slave 42	58	Slave 58
11	Slave 11	27	Slave 27	43	Slave 43	59	Slave 59
12	Slave 12	28	Slave 28	44	Slave 44	60	Slave 60
13	Slave 13	29	Slave 29	45	Slave 45	61	Slave 61
14	Slave 14	30	Slave 30	46	Slave 46	62	Slave 62
15	Slave 15	31	Slave 31	47	Slave 47	63	Slave 63
16	Slave 16	32	Slave 32	48	Slave 48	64	Reserved

Table 7.2 Mapping between Data Position No. and Slave Addresses for Input Data of Port 2

Data position No.	Slave Address	Data position No.	Slave Address	Data position No.	Slave Address	Data position No.	Slave Address
65	Slave 1	81	Slave 17	97	Slave 33	113	Slave 49
66	Slave 2	82	Slave 18	98	Slave 34	114	Slave 50
67	Slave 3	83	Slave 19	99	Slave 35	115	Slave 51
68	Slave 4	84	Slave 20	100	Slave 36	116	Slave 52
69	Slave 5	85	Slave 21	101	Slave 37	117	Slave 53
70	Slave 6	86	Slave 22	102	Slave 38	118	Slave 54
71	Slave 7	87	Slave 23	103	Slave 39	119	Slave 55
72	Slave 8	88	Slave 24	104	Slave 40	120	Slave 56
73	Slave 9	89	Slave 25	105	Slave 41	121	Slave 57
74	Slave 10	90	Slave 26	106	Slave 42	122	Slave 58
75	Slave 11	91	Slave 27	107	Slave 43	123	Slave 59
76	Slave 12	92	Slave 28	108	Slave 44	124	Slave 60
77	Slave 13	93	Slave 29	109	Slave 45	125	Slave 61
78	Slave 14	94	Slave 30	110	Slave 46	126	Slave 62
79	Slave 15	95	Slave 31	111	Slave 47	127	Slave 63
80	Slave 16	96	Slave 32	112	Slave 48	128	Reserved

7.2 Output Data Area

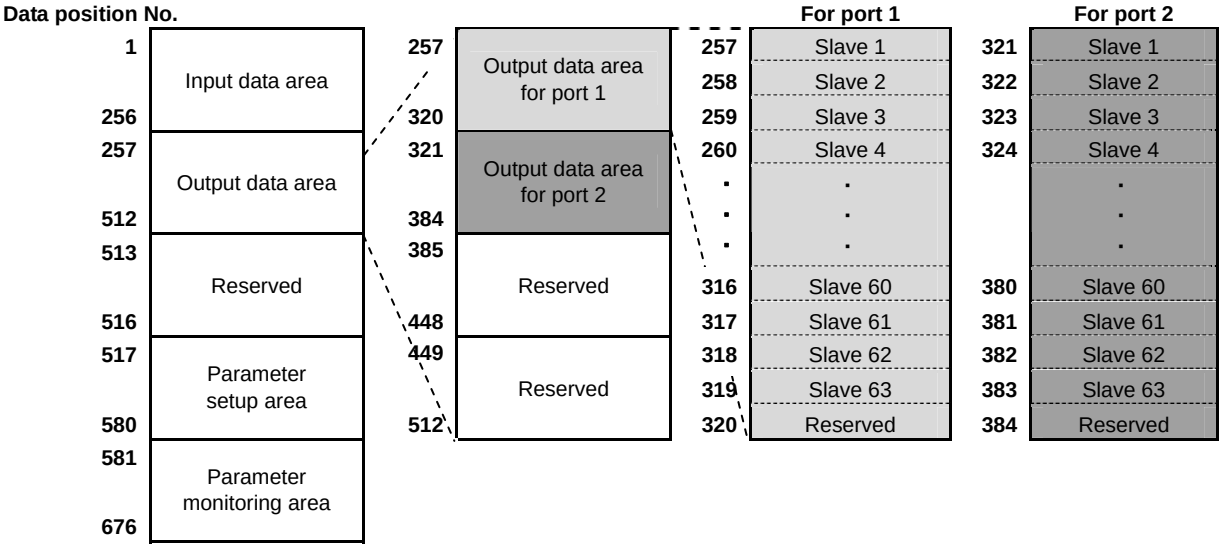


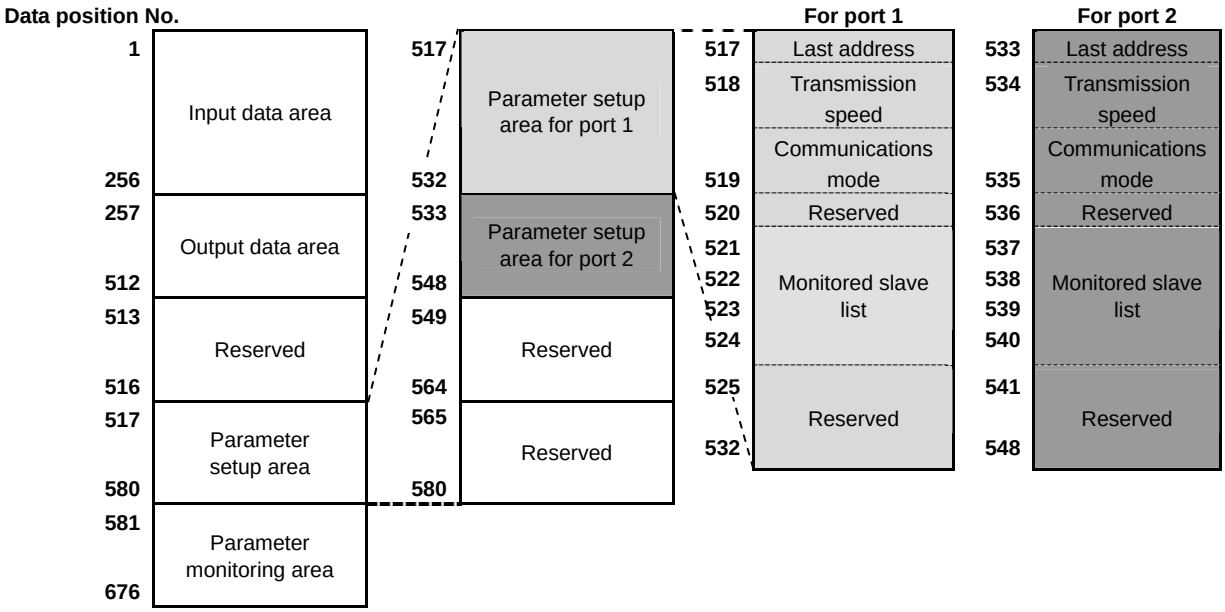
Table 7.3 Mapping between Data Position No. and Slave Addresses for Output Data of Port 1

Data position No.	Slave Address	Data position No.	Slave Address	Data position No.	Slave Address	Data position No.	Slave Address
257	Slave 1	273	Slave 17	289	Slave 33	305	Slave 49
258	Slave 2	274	Slave 18	290	Slave 34	306	Slave 50
259	Slave 3	275	Slave 19	291	Slave 35	307	Slave 51
260	Slave 4	276	Slave 20	292	Slave 36	308	Slave 52
261	Slave 5	277	Slave 21	293	Slave 37	309	Slave 53
262	Slave 6	278	Slave 22	294	Slave 38	310	Slave 54
263	Slave 7	279	Slave 23	295	Slave 39	311	Slave 55
264	Slave 8	280	Slave 24	296	Slave 40	312	Slave 56
265	Slave 9	281	Slave 25	297	Slave 41	313	Slave 57
266	Slave 10	282	Slave 26	298	Slave 42	314	Slave 58
267	Slave 11	283	Slave 27	299	Slave 43	315	Slave 59
268	Slave 12	284	Slave 28	300	Slave 44	316	Slave 60
269	Slave 13	285	Slave 29	301	Slave 45	317	Slave 61
270	Slave 14	286	Slave 30	302	Slave 46	318	Slave 62
271	Slave 15	287	Slave 31	303	Slave 47	319	Slave 63
272	Slave 16	288	Slave 32	304	Slave 48	320	Reserved

Table 7.4 Mapping between Data Position No. and Slave Addresses for Output Data of Port 2

Data position No.	Slave Address	Data position No.	Slave Address	Data position No.	Slave Address	Data position No.	Slave Address
321	Slave 1	337	Slave 17	353	Slave 33	369	Slave 49
322	Slave 2	338	Slave 18	354	Slave 34	370	Slave 50
323	Slave 3	339	Slave 19	355	Slave 35	371	Slave 51
324	Slave 4	340	Slave 20	356	Slave 36	372	Slave 52
325	Slave 5	341	Slave 21	357	Slave 37	373	Slave 53
326	Slave 6	342	Slave 22	358	Slave 38	374	Slave 54
327	Slave 7	343	Slave 23	359	Slave 39	375	Slave 55
328	Slave 8	344	Slave 24	360	Slave 40	376	Slave 56
329	Slave 9	345	Slave 25	361	Slave 41	377	Slave 57
330	Slave 10	346	Slave 26	362	Slave 42	378	Slave 58
331	Slave 11	347	Slave 27	363	Slave 43	379	Slave 59
332	Slave 12	348	Slave 28	364	Slave 44	380	Slave 60
333	Slave 13	349	Slave 29	365	Slave 45	381	Slave 61
334	Slave 14	350	Slave 30	366	Slave 46	382	Slave 62
335	Slave 15	351	Slave 31	367	Slave 47	383	Slave 63
336	Slave 16	352	Slave 32	368	Slave 48	384	Reserved

7.3 Parameter Setup Area



Data position No.		Description		Default
For port 1	For port 2			
517	533	Last address	Between 1 and 63 Other values are treated as 63.	63
518	534	Transmission speed	0 : 12 Mbps 1 : 6 Mbps 2 : 3 Mbps Others : 12 Mbps.	0
519	535	Communications mode	0 : Full-duplex 1 : Half-duplex Others : Full-duplex.	0
520	536	Reserved		
521 to 524	537 to 540	Monitored slave list	0 : Not monitored 1 : Monitored	1
525 to 532	541 to 548	Reserved		

7.3.1 Last Address

The Last Address parameter specifies the maximum slave unit address value that can be specified for communication. Specify this parameter as the largest slave unit address value or a larger value. The specified value must be between 1 and 63. If the specified last address is beyond this range, it is assumed to be 63.

CAUTION

- A slave unit whose address is larger than the specified last address will not be included for communication with the master module and, therefore, its input/output data, alive list and error monitoring information is not updated.
- Beware that setting the last address to a number larger than the number of slave units actually used lengthens remote scan time unnecessarily.
- Last Address parameter value 1 is not allowed for full-duplex communications. When using full-duplex communications, specify the last address as 2 even if there is only one slave unit. Last Address parameter value 1 is valid, however, for half-duplex communications.
- Any change to the last address setting is applied when the Request to Communicate relay is turned on. Changing the setting while the Request to Communicate relay is on has no effect.

7.3.2 Transmission Speed

Specify the transmission speed of the master module to be the same as that of the slave units. There are three transmission speed options:

0: 12 Mbps

1: 6 Mbps

2: 3 Mbps

The default is 0 (=12 Mbps). If a number other than 0, 1 or 2 is specified, 0 (=12 Mbps) is assumed.

CAUTION

- Any change to the transmission speed setting is applied when the Request to Communicate relay is turned on. Changing the setting while the Request to Communicate relay is on has no effect.
- The total transmission distance for a connector depends on the transmission speed setting; the total transmission distance is 100 m at 12 Mbps, 200 m 6 Mbps, and 300 m at 3 Mbps. If the total transmission distance exceeds 100 m, specify the transmission speed as 6 Mbps or 3 Mbps. If the total transmission distance exceeds 200 m, specify the transmission speed as 3 Mbps. Communication will fail if the total transmission distance exceeds 300 m.

7.3.3 Communications Mode

Specify the communications mode of the master module to be the same as that of the slave units. There are two communications mode options:

0: Full-duplex

1: Half-duplex

The default is 0 (= full-duplex). If a number other than 0 or 1 is specified, 0 (= full-duplex) is assumed.

CAUTION

- Any change to the commiunications mode setting is applied when the Request to Communicate relay is turned on. Changing the setting while the Request to Communicate relay is on has no effect.
- Remote scan time of half-duplex communications is double that of full-duplex communications.
- To specify the last address parameter as 1, you must specify communications mode as half-duplex.

7.3.4 Monitored Slave List

You can specify which slave units are to be monitored for communication error. To monitor error for a specific slave unit, set the bit of the Monitored Slave List corresponding to its slave address to 1. If a communication error with a monitored slave unit is detected, the ALARM relay turns on and the A (ALARM) LED located on the module front lights up.

By default, all slave units are monitored for communication error.

For port 1

Data position No.	15															0
521	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
522	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
523	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
524		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

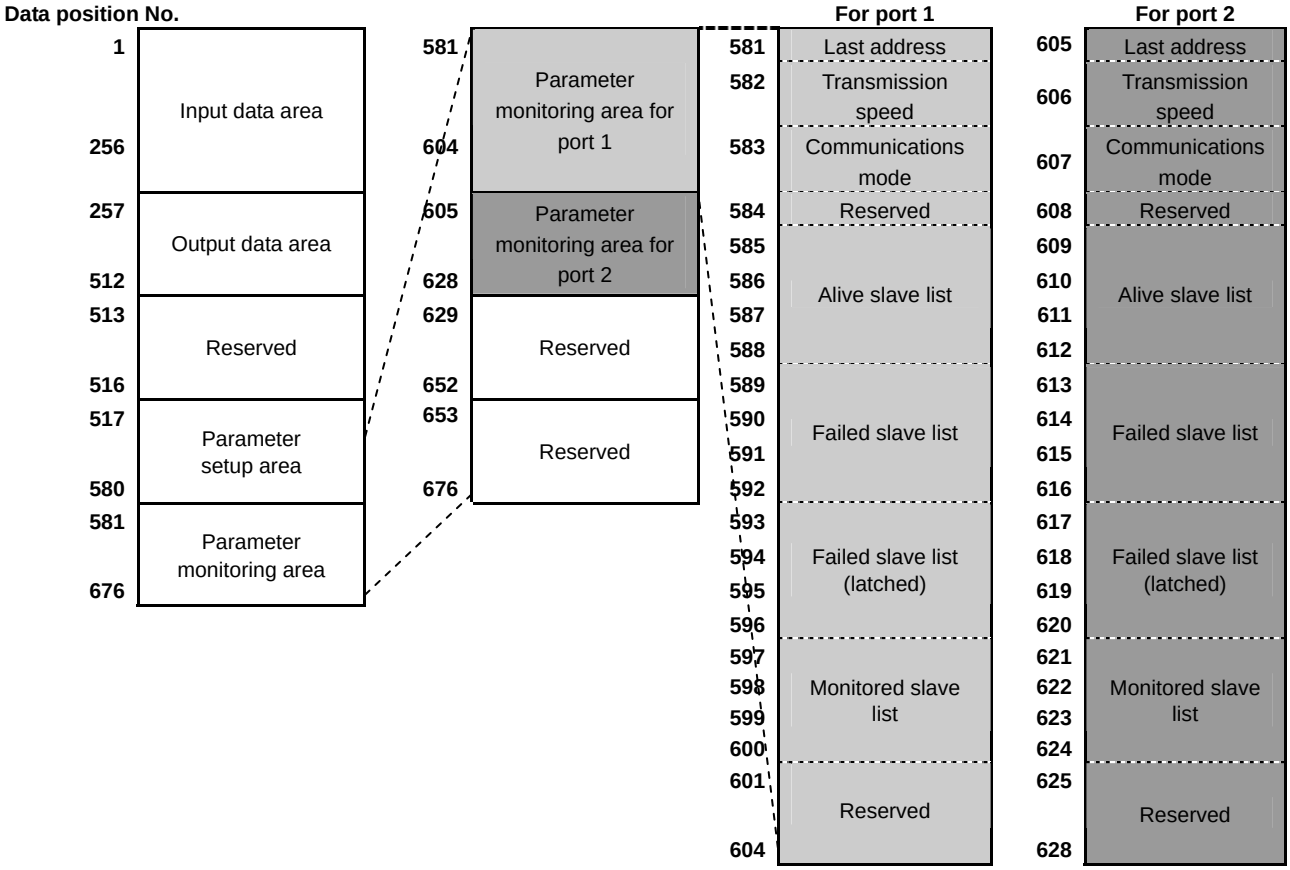
For port 2

Data position No.	15															0
537	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
538	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
539	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
540		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

CAUTION

- If a slave unit is not specified for communication error monitoring, the ALARM relay will not turn on and the A (ALARM) LED will not light up even if a communication error occurs with the slave unit.
- Any change to the Monitored Slave List is applied when the Request to Communicate relay is turned on. Changing the setting while the Request to Communicate relay is on has no effect.

7.4 Parameter Monitoring Area



Data position No.		Description	
For port 1	For port 2		
581	605	Last address	Between 1 and 63
582	606	Transmission speed	0 : 12Mbps 1 : 6Mbps 2 : 3Mbps
583	607	Communications mode	0 : Full-duplex 1 : Half-duplex
584	608	Reserved	
585 to 588	609 to 612	Alive slave list	0 : Error 1 : Normal
589 to 592	613 to 616	Failed slave list	0 : Normal 1 : Error
593 to 596	617 to 620	Failed slave list (latched)	0 : Normal 1 : Error
597 to 600	621 to 624	Monitored slave list	0 : Not monitored 1 : Monitored
601 to 604	625 to 628	Reserved	

7.4.1 Last Address

This parameter monitors the last address setting for the current communication cycle.

7.4.2 Transmission Speed

This parameter monitors the transmission speed setting for the current communication cycle.

7.4.3 Communications Mode

This parameter monitors the communications mode setting for the current communication cycle.

7.4.4 Alive Slave List

This parameter monitors the statuses of connected slave units.

If a slave is available for communication, its corresponding alive bit is set to 1. If a slave is unavailable for communication because it is powered off or for some other reason, its corresponding bit is reset to 0.

For port 1

Data position No.	15															0
585	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
586	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
587	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
588		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

For port 2

Data position No.	15															0
609	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
610	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
611	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
612		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

7.4.5 Failed Slave List (non-latched)

While scanning slave units within the address range defined by the Last Address parameter, if a problem is detected during communications with a slave unit specified for error monitoring, its corresponding bit in the Failed Slave List (non-latched) is set to 1.

When the problem disappears (for instance, when a transient noise disappears so that the slave becomes accessible in the subsequent scan), the bit is automatically reset to 0.

If the bit of any slave unit is set to 1, the A (ALARM) LED lights up and the ALARM relay turns on.

For port 1

Data position No.	15															0
589	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
590	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
591	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
592		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

For port 2

Data position No.	15															0
613	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
614	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
615	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
616		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

CAUTION

- The Failed Slave List (non-latched) parameter reflects the quality of communications, while the Alive Slave List parameter indicates which slave units are available for communication.

7.4.6 Failed Slave List (latched)

While scanning slave units within the address range defined by the Last Address parameter, if a problem is detected during communications with a slave unit specified for error monitoring, its corresponding bit in the Failed Slave List (latched) is set to 1.

Once turned on, a bit is not reset to 0 even when the problem disappears. To reset a bit, you must overwrite the bit with 0 using a user program.

For port 1

Data position No.	15															0
593	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
594	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
595	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
596		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

For port 2

Data position No.	15															0
617	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
618	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
619	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
620		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

CAUTION

- The Failed Slave List (latched) parameter reflects the quality of communications, while the Alive Slave List paramete indicates which slave units are available for communication.

7.4.7 Monitored Slave List

This parameter indicates which slave units are currently monitored for error. Bits corresponding to slave units that are currently monitored for error are set to 1.

For port 1

Data position No.	15															0
597	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
598	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
599	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
600		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

For port 2

Data position No.	15															0
621	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
622	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
623	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
624		63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

8. Troubleshooting

8.1 Troubleshooting Using LEDs

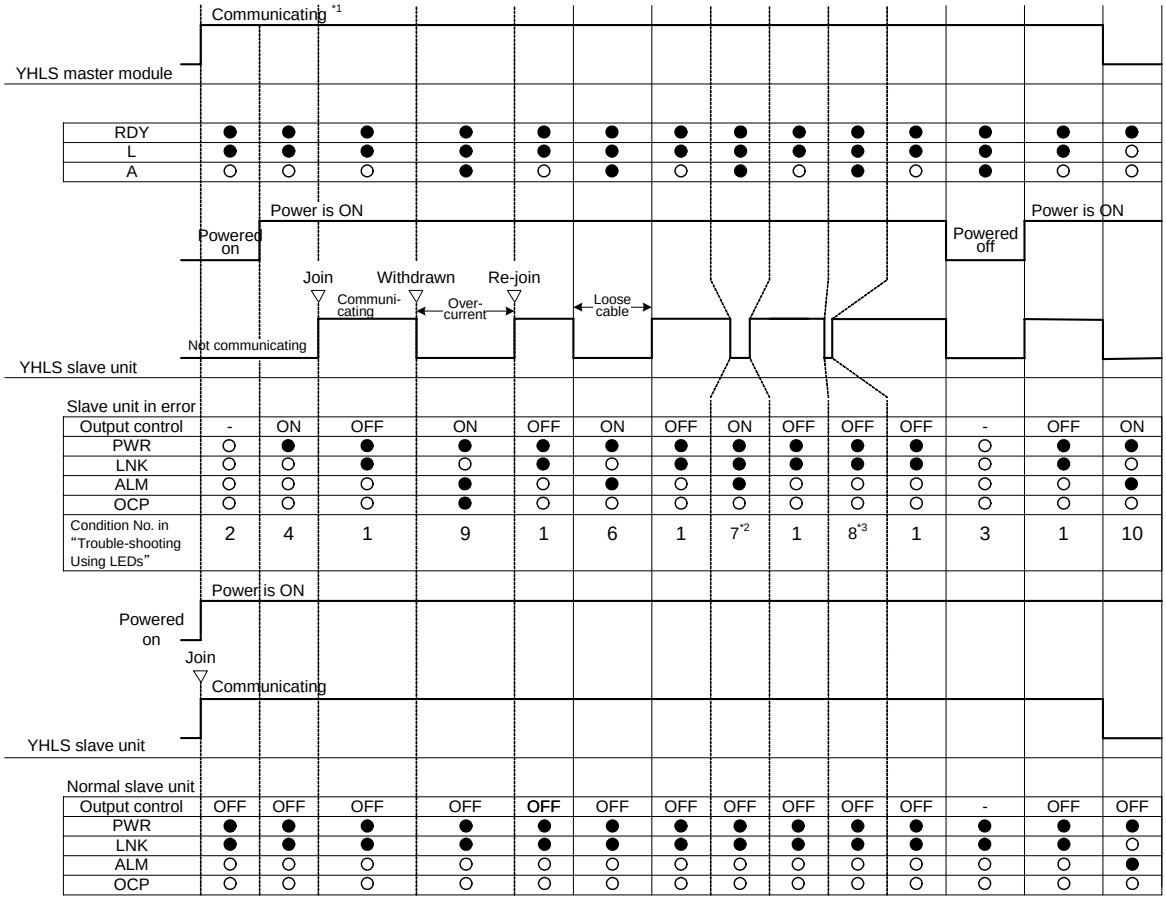
This section describes how to check communication statuses using LED indicators of the master module and the LED indicators of the YHLS slave units. The timing charts are shown on the following page.

No.	When two or more slave units are connected			When only one slave unit is connected		Causes	Remedies
	Master module	Slave unit normal	Slave unit in error	Master module	Slave unit in error		
1	RDY ● L ● A ○	PWR ● LNK ● ALM ○ OCP ○	PWR ● LNK ● ALM ○ OCP ○	RDY ● L ● A ○	PWR ● LNK ● ALM ○ OCP ○	No cause of error	- Normal. No need of remedy.
2	RDY ● L ● A ○	PWR ● LNK ● ALM ○ OCP ○	PWR ○ LNK ○ ALM ○ OCP ○	RDY ● L ○ A ○	PWR ○ LNK ○ ALM ○ OCP ○	No power to slave unit	- Check the 24 V DC power supply and power cable.
3	RDY ● L ● A ●	PWR ● LNK ● ALM ○ OCP ○	PWR ○ LNK ○ ALM ○ OCP ○	RDY ● L ○ A ●	PWR ○ LNK ○ ALM ○ OCP ○	Communication was once successful but there is now no power to slave unit	- Check the 24 V DC power supply and power cable.
4	RDY ● L ● A ○	PWR ● LNK ● ALM ○ OCP ○	PWR ● LNK ○ ALM ○ OCP ○	RDY ● L ○ A ○	PWR ● LNK ○ ALM ○ OCP ○	Power supply is normal but communication has never been successful.	- Check the FS area, cables, address settings and communication settings.
5	RDY ● L ● A ○	PWR ● LNK ● ALM ○ OCP ○	PWR ● LNK ○ ALM ○ OCP ●	RDY ● L ○ A ○	PWR ● LNK ○ ALM ○ OCP ●	OCP is triggered right after power on and communication has never been successful.	- Remove the cause of overcurrent.
6	RDY ● L ● A ●	PWR ● LNK ● ALM ○ OCP ○	PWR ● LNK ○ ALM ● OCP ○	RDY ● L ○ A ●	PWR ● LNK ○ ALM ● OCP ○	Communication was once successful but now fails.	- Check cables and connectors for loose connection.
7	RDY ● L ● A ●	PWR ● LNK ● ALM ○ OCP ○	PWR ● LNK ● ALM ● OCP ○	RDY ● L ● A ●	PWR ● LNK ● ALM ● OCP ○	Communication is sometimes successful but not reliable over a long period.	- Ensure that the terminating resistor switch on the farthest slave unit on a communications line is on. - Ensure that no more than 32 slave units are connected to each connector on the master module. - Ensure that transmission speed and maximum transmission distance constraints are met. - Ensure that recommended cables are used.
8	RDY ● L ● A ●	PWR ● LNK ● ALM ○ OCP ○	PWR ● LNK ● ALM ○ OCP ○	RDY ● L ● A ●	PWR ● LNK ● ALM ○ OCP ○	Communication is sometimes successful but not reliable even over a short period.	- Ensure that no slave address is duplicated. - Ensure that the terminating resistor switch on the farthest slave unit on a communications line is on. - Ensure that no more than 32 slave units are connected to each connector on the master module. - Ensure that transmission speed and maximum transmission distance constraints are met. - Ensure that recommended cables are used. - Check for excessive noise, and implement noise suppression measures if necessary.
9	RDY ● L ● A ●	PWR ● LNK ● ALM ○ OCP ○	PWR ● LNK ○ ALM ● OCP ●	RDY ● L ○ A ●	PWR ● LNK ○ ALM ● OCP ●	Communication was once successful but the slave was later disconnected by OCP.	- Remove the cause of overcurrent.
10	RDY ● L ○ A ○	PWR ● LNK ○ ALM ● OCP ○	PWR ● LNK ○ ALM ● OCP ○	RDY ● L ○ A ○	PWR ● LNK ○ ALM ● OCP ○	Communication was once successful but the master module is now not accessible.	- Check the RDY, RUN, ALM and ERR LEDs on the CPU module. - Check the RDY LED on the YHLS master module. - Check the user program for its control of the Request to Communicate relay.

Troubleshooting according to the statuses of LEDs on the YHLS master module and slave unit (s).
- When only one slave unit is connected, only one slave unit may be in error.
- When two or more slave units are connected, one or more slave units may be either normal or in error.

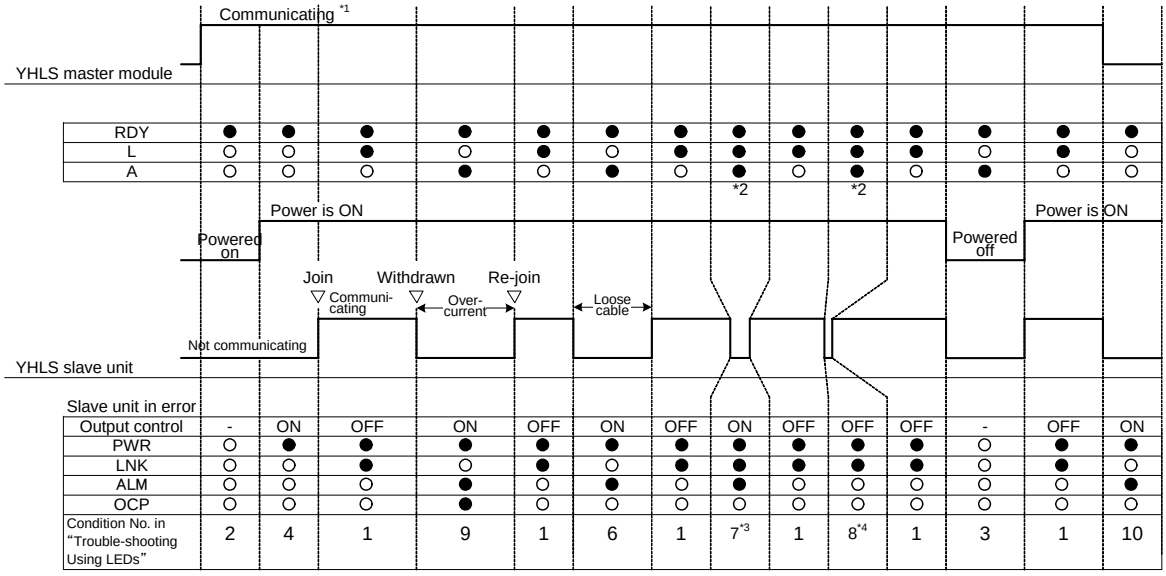
●: lit, ○: not lit

● Timing chart (when two or more slave units are connected)



*1: X□□□01 (port 1) or X□□□09 (port 2) is ON.
*2: LNK and ALM blink alternately.
Condition No. 5 in "Troubleshooting Using LEDs" above rarely occurs and is thus omitted from this timing chart.
*3: The master module's slave error monitoring latched-type registers can be used to identify the slave unit in error.
●: lit, ○: not lit.

● Timing chart (when only one slave unit is connected)

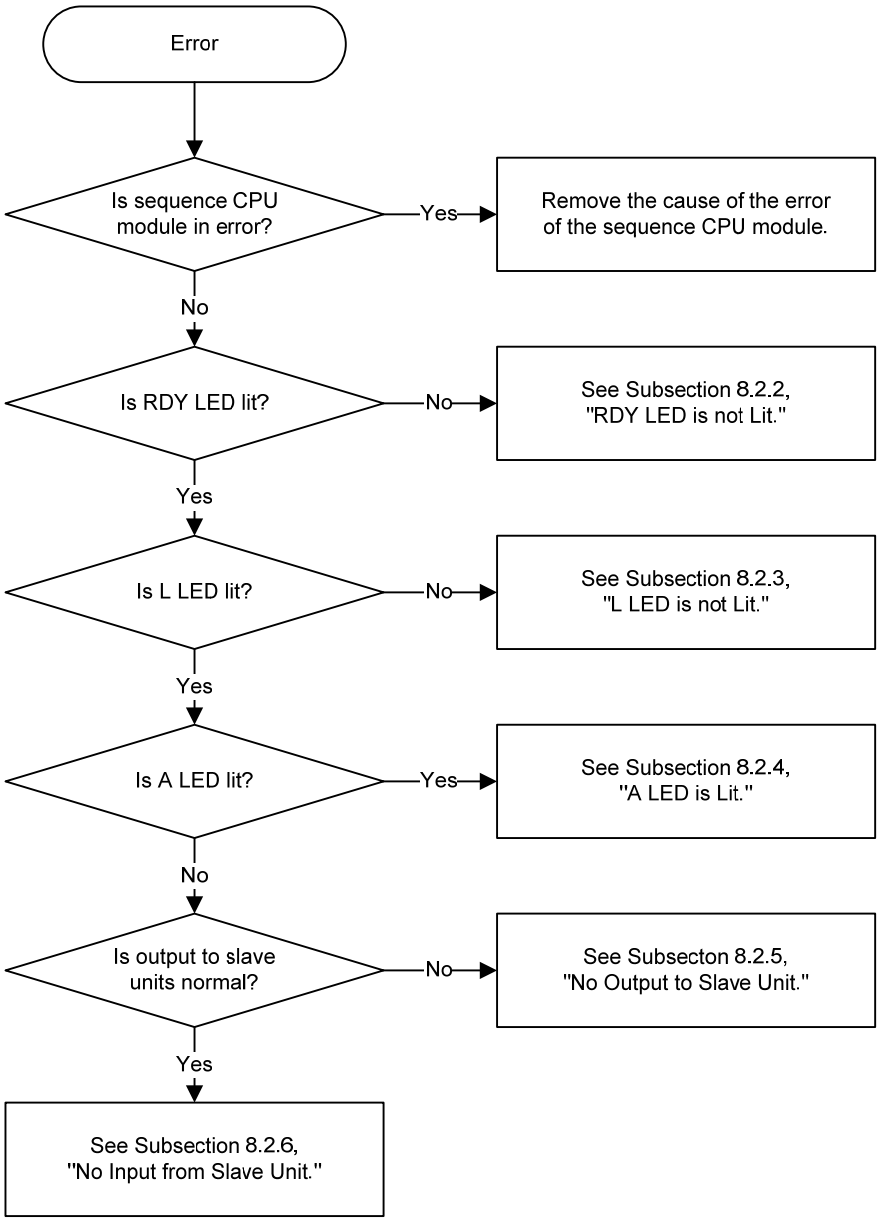


*1: X□□□01 (port 1) or X□□□09 (port 2) is ON.
*2: L and A blink alternately.
*3: LNK and ALM blink alternately.
Condition No. 5 in "Troubleshooting Using LEDs" above rarely occurs and is thus omitted from this timing chart.
*4: The master module's slave error monitoring latched-type registers can be used to identify slave units in error.
●: lit, ○: not lit.

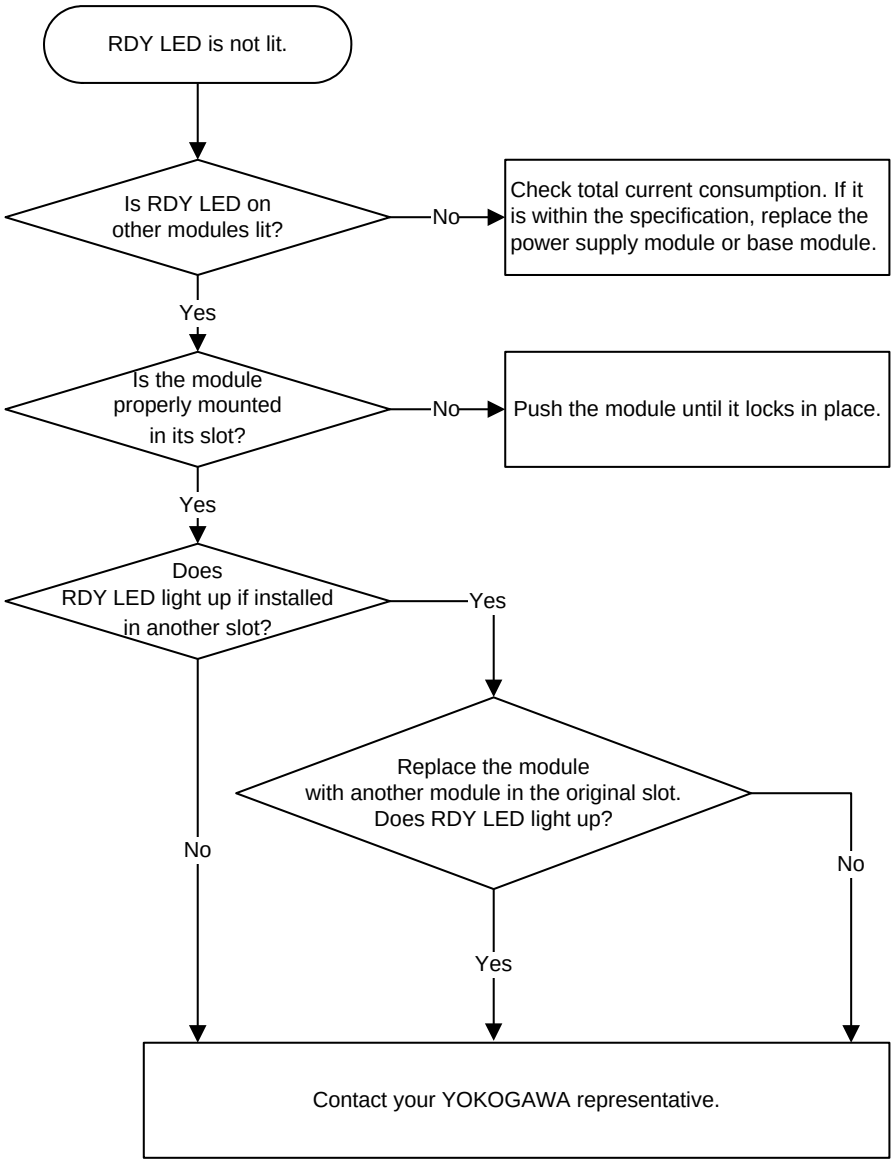
8.2 Troubleshooting Using FlowCharts

8.2.1 Main Flowchart

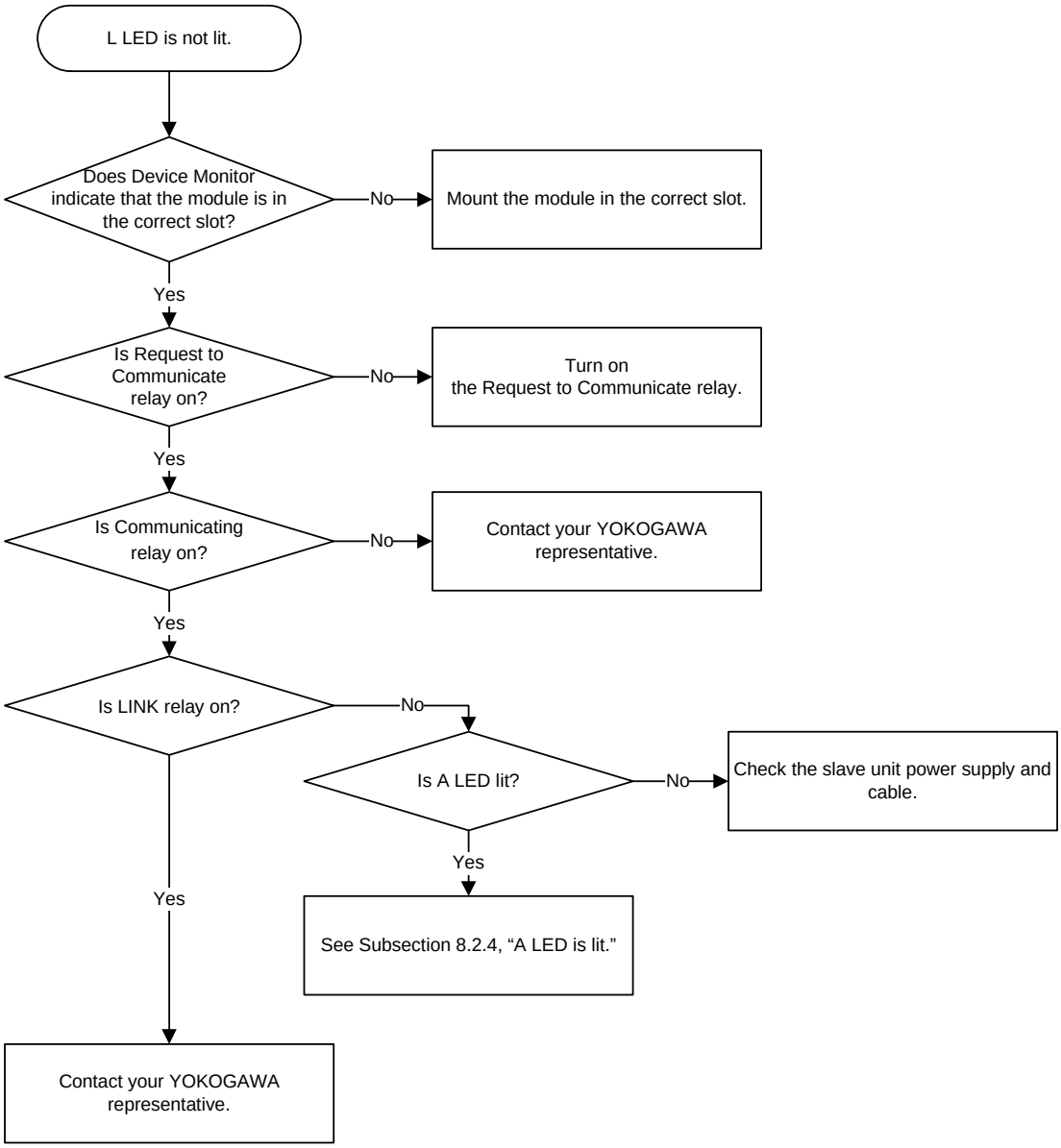
The following is the main flowchart for troubleshooting. Branch from this main flowchart to specific flowcharts given in different subsections to locate and correct different causes of problems.



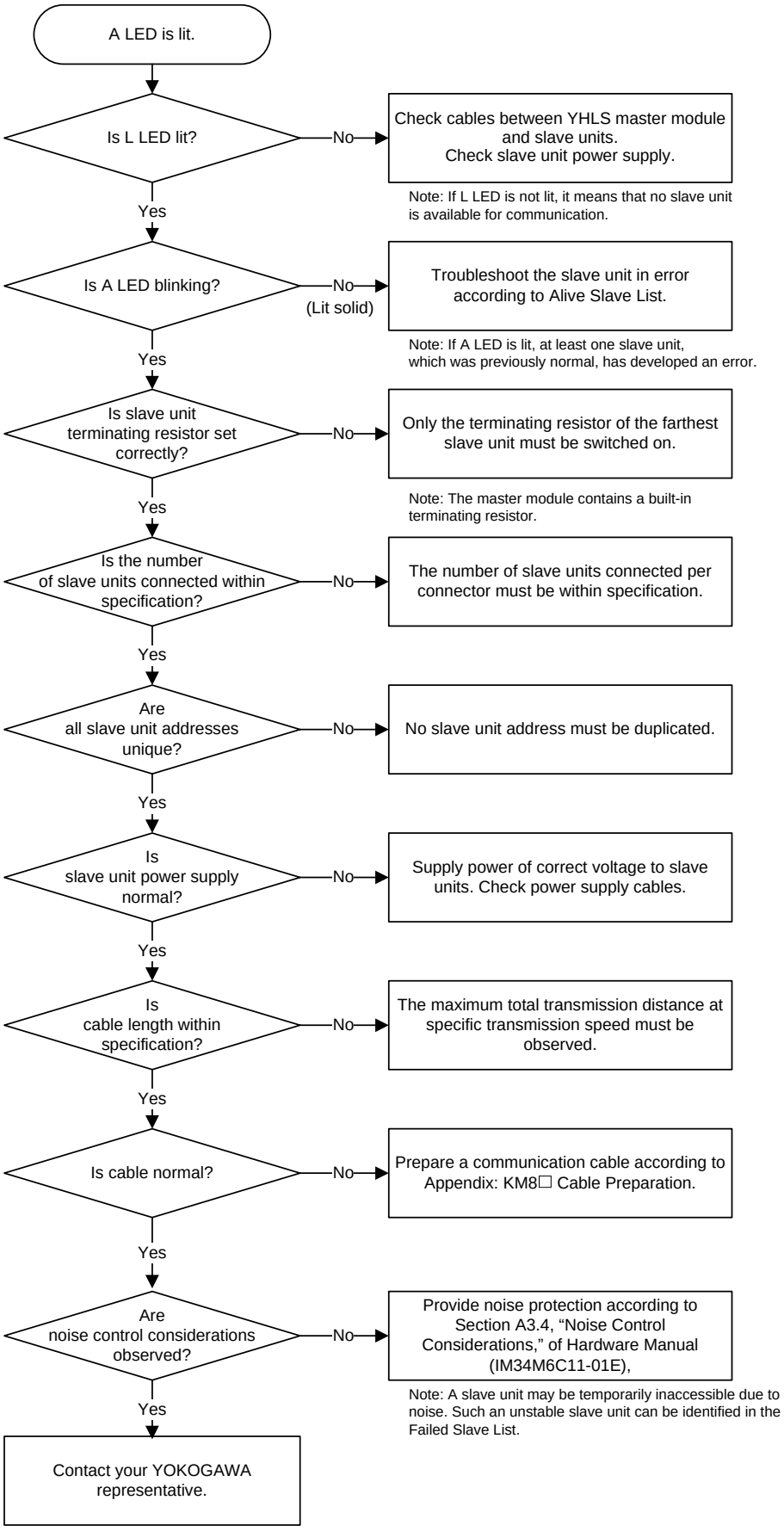
8.2.2 RDY LED is not Lit



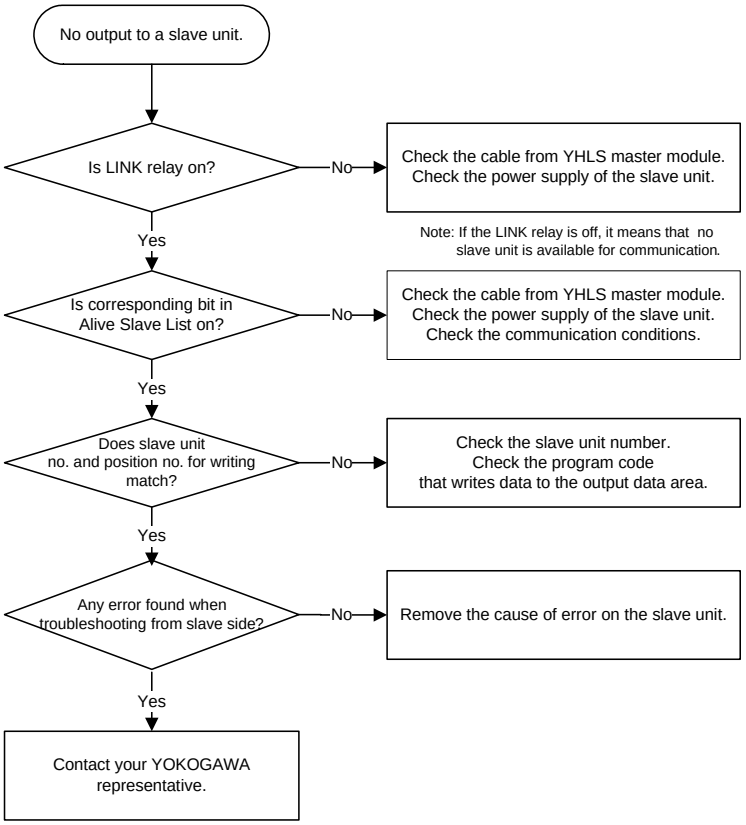
8.2.3 L LED is not Lit



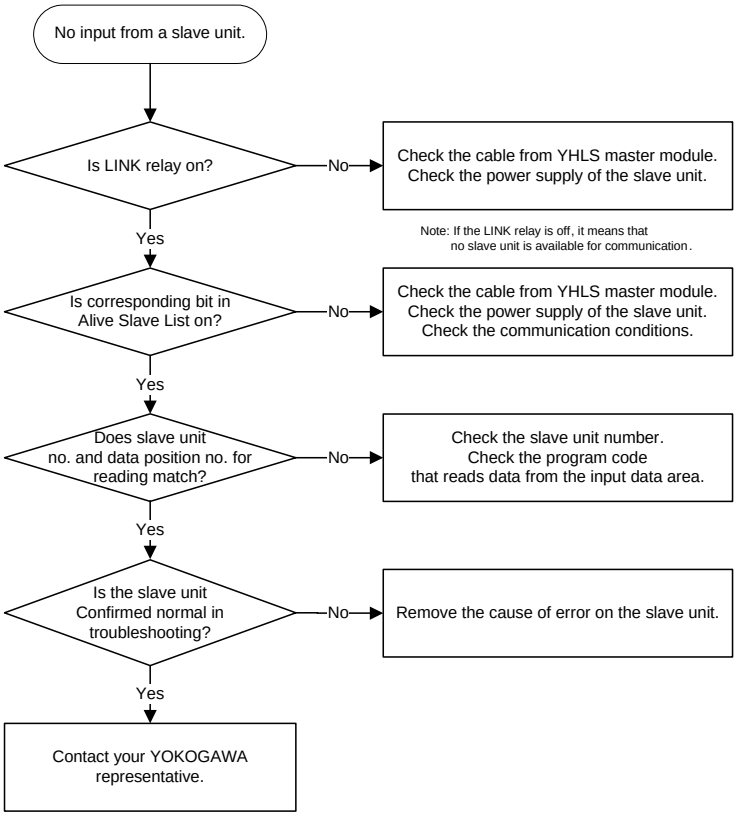
8.2.4 A LED is Lit



8.2.5 No Output to Slave Unit



8.2.6 No Input from Slave Unit



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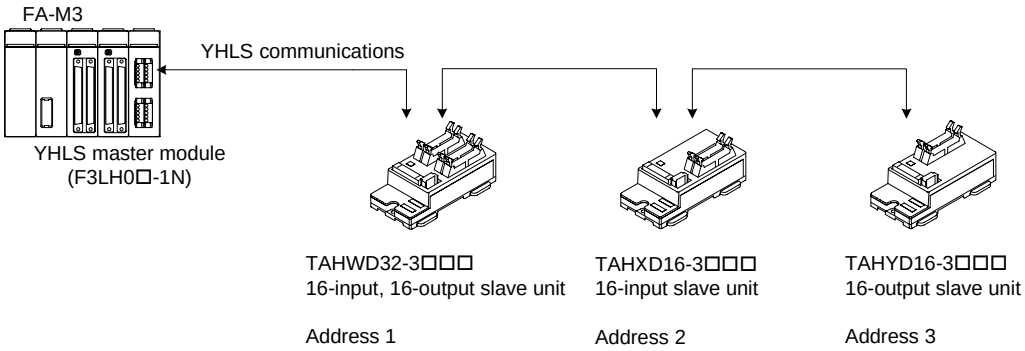
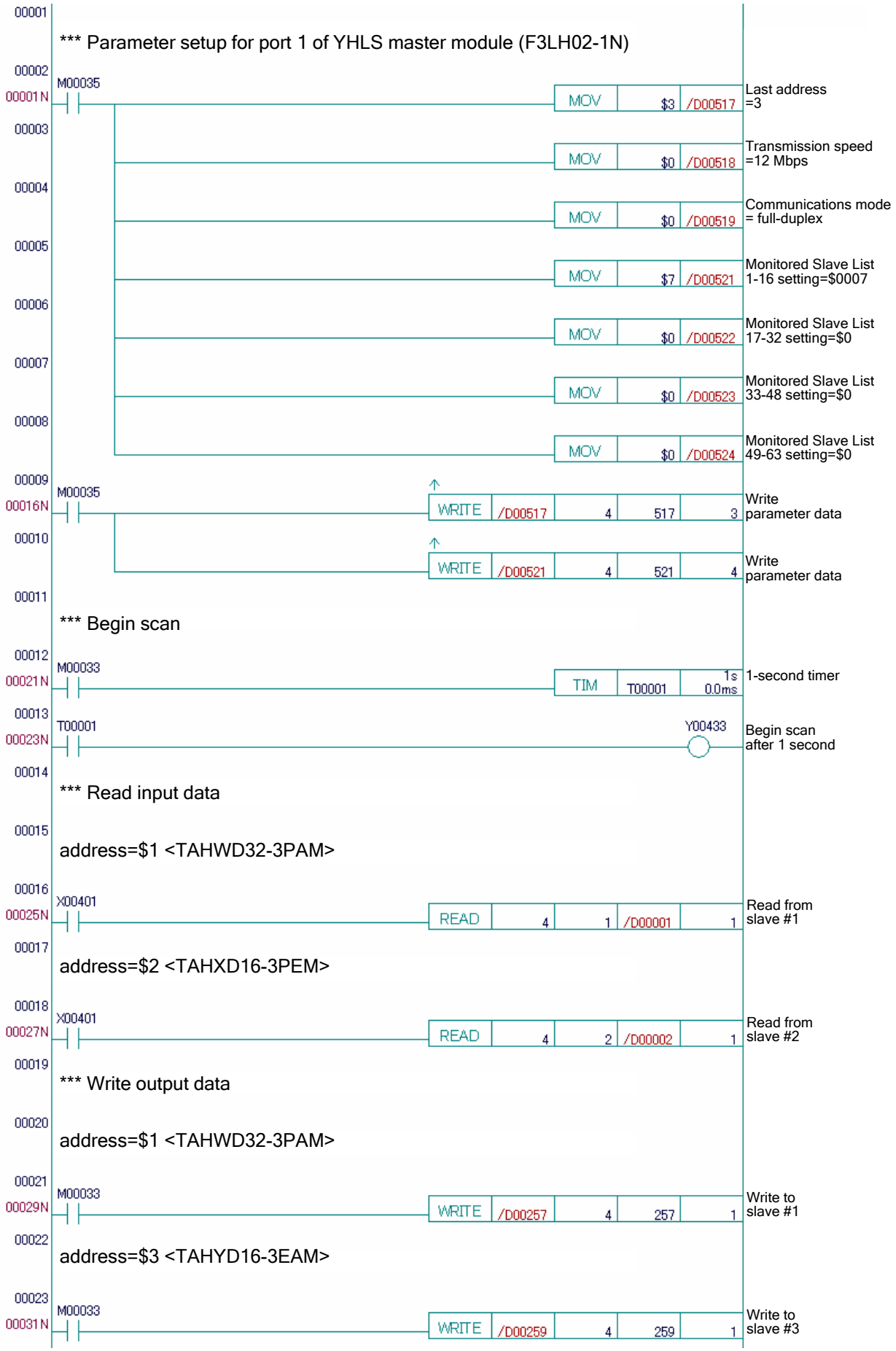
9. Sample Program

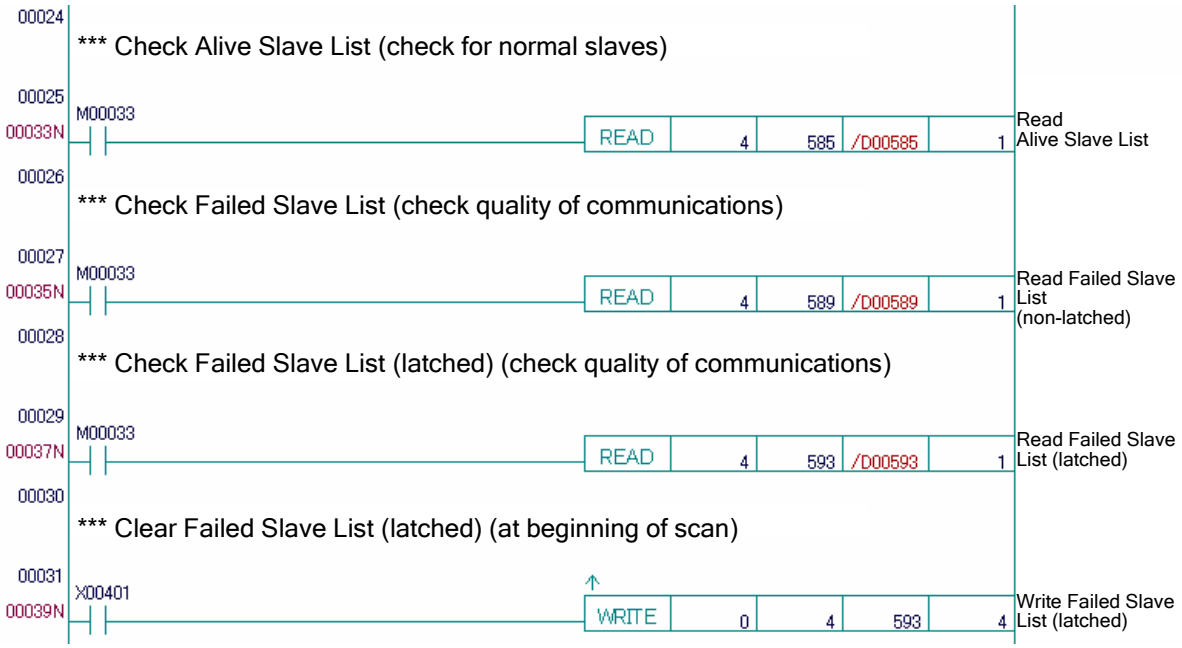
The sample program below assumes that the YHLS master module (F3LH02-1N) is installed in slot 4 of the FA-M3 main unit and YHLS slave units are connected to port 1 of the master module as shown in the figure below.



The sample program reads input data from each input slave unit into D registers, and writes output data stored in D registers to each output slave unit.

The program checks the statuses of slave units by reading the Slave Alive List, the Failed Slave List (non-latched) and the Failed Slave List (latched). It clears the Failed Slave List (latched) parameter at the beginning of scanning (on rising edge of input relay X00401).


00001
*** Parameter setup for port 1 of YHLS master module (F3LH02-1N)
00002
M00035
00001N
MOV $3 /D00517
Last address =3
00003
MOV $0 /D00518
Transmission speed =12 Mbps
00004
MOV $0 /D00519
Communications mode = full-duplex
00005
MOV $7 /D00521
Monitored Slave List 1-16 setting=$0007
00006
MOV $0 /D00522
Monitored Slave List 17-32 setting=$0
00007
MOV $0 /D00523
Monitored Slave List 33-48 setting=$0
00008
MOV $0 /D00524
Monitored Slave List 49-63 setting=$0
00009
M00035
00016N
WRITE /D00517 4 517 3
Write parameter data
00010
WRITE /D00521 4 521 4
Write parameter data
00011
*** Begin scan
00012
M00033
00021N
TIM T00001 1s 0.0ms
1-second timer
00013
T00001
00023N
Y00433
Begin scan after 1 second
00014
*** Read input data
00015
address=$1 <TAHWD32-3PAM>
00016
X00401
00025N
READ 4 1 /D00001 1
Read from slave #1
00017
address=$2 <TAHXD16-3PEM>
00018
X00401
00027N
READ 4 2 /D00002 1
Read from slave #2
00019
*** Write output data
00020
address=$1 <TAHWD32-3PAM>
00021
M00033
00029N
WRITE /D00257 4 257 1
Write to slave #1
00022
address=$3 <TAHYD16-3EAM>
00023
M00033
00031N
WRITE /D00259 4 259 1
Write to slave #3


00024
*** Check Alive Slave List (check for normal slaves)
00025
M00033
00033N
READ 4 585 /D00585 1
Read Alive Slave List
00026
*** Check Failed Slave List (check quality of communications)
00027
M00033
00035N
READ 4 589 /D00589 1
Read Failed Slave List (non-latched)
00028
*** Check Failed Slave List (latched) (check quality of communications)
00029
M00033
00037N
READ 4 593 /D00593 1
Read Failed Slave List (latched)
00030
*** Clear Failed Slave List (latched) (at beginning of scan)
00031
X00401
00039N
WRITE 0 4 593 4
Write Failed Slave List (latched)

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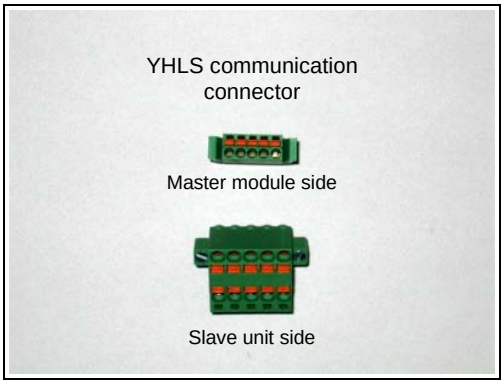
Appendix: KM8□ Cable Preparation

(1) Components and tools

- YHLS communication connector

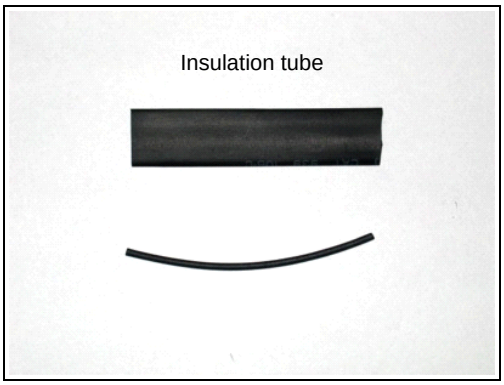
For master module (example):
Manufacturer: Phoenix Contact
Model: FMC 1,5/5-ST-3,5-RF

For slave units (example):
Manufacturer: Phoenix Contact
Model: TFKC 2,5/5-STF-5,08 AU



- Insulation tube

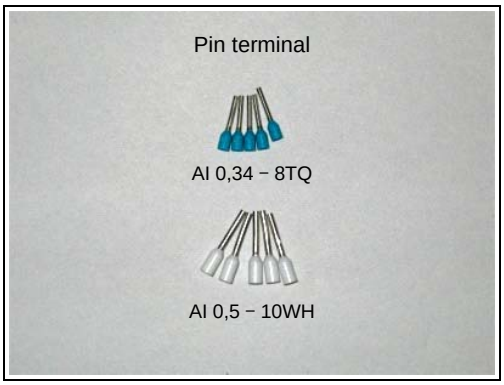
For cable insulation and drain insulation (example):
Approx. 8 mm diameter for fixed cable with 22 AWG drain, or
Approx. 11 mm diameter for flexible cable with 22 AWG drain



- Pin terminal

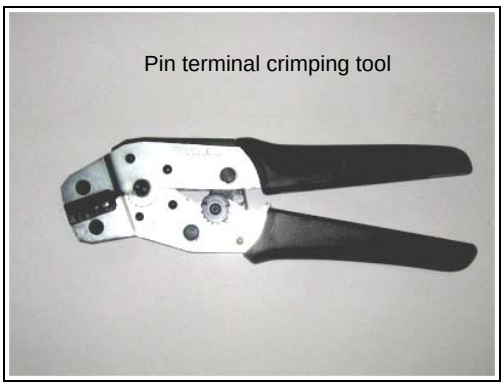
For fixed cable (example):
Manufacturer: Phoenix Contact
Model: AI 0,34 – 8 TQ

For flexible cable (example):
Manufacturer: Phoenix Contact
Model: AI 0,5 – 10 WH



- Pin terminal crimping tool

(Example)
Manufacturer: Phoenix Contact
Model: CRIMPFOX ZA3



- Wire stripper

(Example 1)
Manufacturer: Hozan Tool Industrial
Model: P-90-A (with green handle)

(Example 2)
Manufacturer: Vessel Co., Inc.
Model: 3000A or 3000C

Note: The picture shows wire stripper model P-911 with black handle from Hozan Tool Industrial. Model P-90-A has a green handle instead.

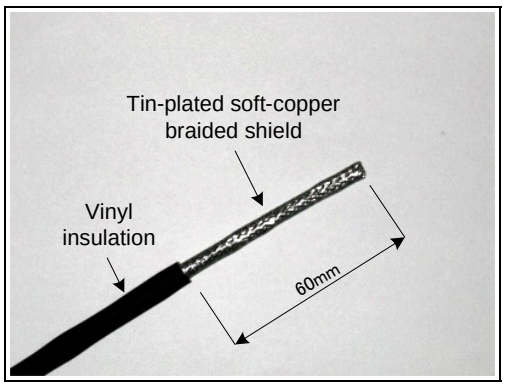
Wire stripper

CAUTION

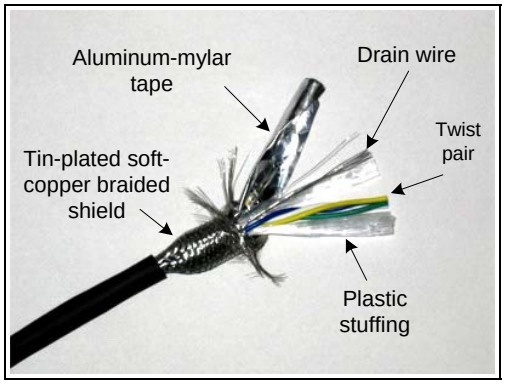
Always use a recommended wire stripper for the KM81 flexible cable. As its wires are fine copper strands, a significant number (or even half) of these strands may be inadvertently cut off during a stripping operation if a non-recommended wire stripper is used.

(2) Preparing a connector-cable set (using a fixed cable and a YHLS communication connector to a master module)

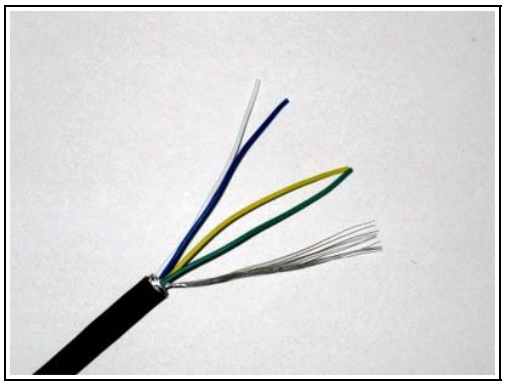
(1) Peel off about 60-mm length of outer vinyl insulation from the cable.



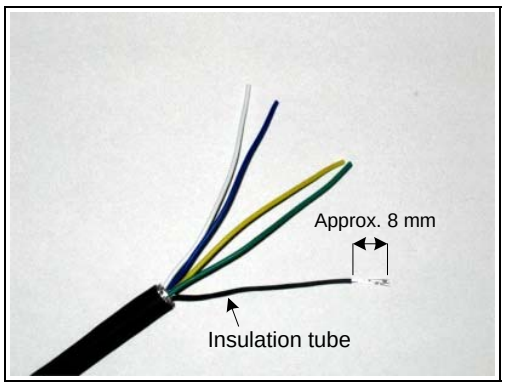
(2) Remove the exposed tin-plated soft-copper braided shield, aluminum-mylar tape, and plastic stuffing. Take care not to damage the exposed drain wire.



(3) Straighten the exposed twisted wires.

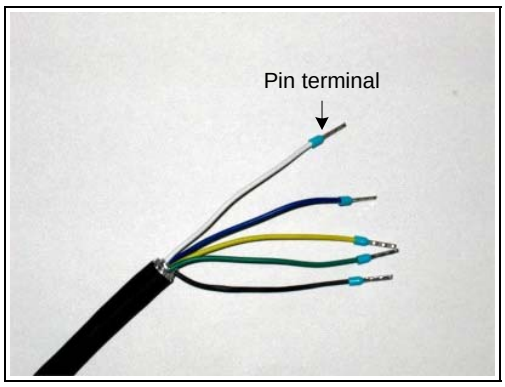


(4) Apply an insulation tube onto the drain wire and shrink the tube with a heat gun.

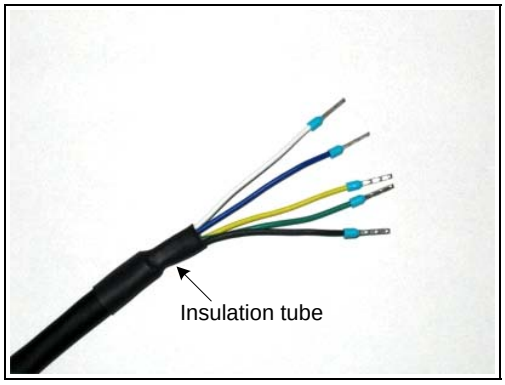


(5) Strip off a sufficient length of the insulation of each wire to allow good electrical contact with a pin terminal. Then put and crimp a pin terminal onto each wire using a crimping tool.

Check that the pin terminal size is compatible with the wire size. Check that each pin terminal is securely crimped to a wire.



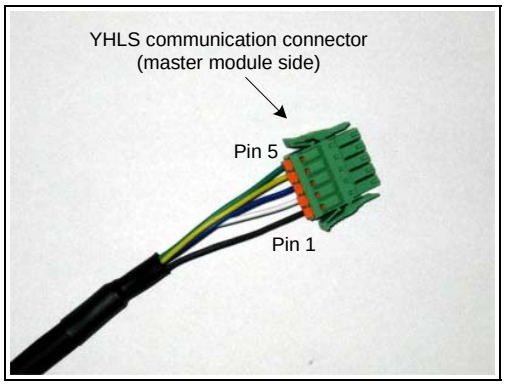
(6) Apply an insulation tube to the cable such that it partially covers both the cable insulation and the exposed wires. Then shrink the tube with a heat gun.



(7) Fully insert each pin terminal into the connector.
Ensure that each pin terminal is securely inserted in the connector.

Pin	Signal Name (master module)		Wire Color (KM8□)	
	Full duplex	Half duplex	Full duplex	Half duplex
5	TxD−	NC	Green	-
4	TxD+	NC	Yellow	-
3	RxD−	TRD−	Blue	Blue
2	RxD+	TRD+	White	White
1	SHIELD	SHIELD	Drain	Drain

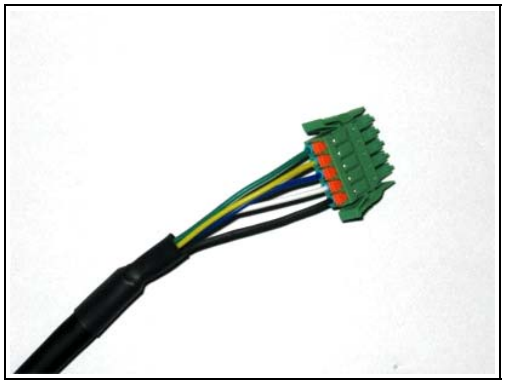
Note: The connector-cable set must become a straight-connection type.



(8) A connector-cable set is completed.

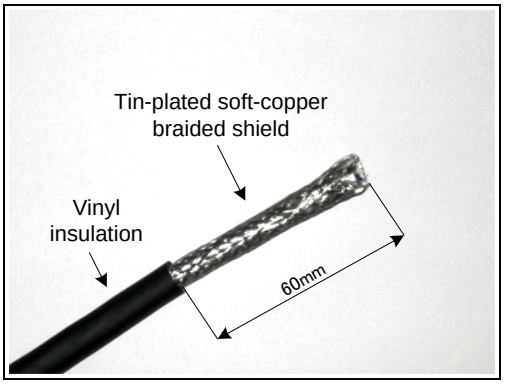
Note: Check the completed connector-cable set for any wrong connection, shorted circuit or open circuit using an ohmmeter or other appropriate instrument.

Note: The connector-cable set preparation procedure is the same for the FMC 1,5/5-ST-3,5-RF connector (for master module) and the TFKC 2,5/5-STF-5,08 AU connector (for slave units). The pictures on the right show the former case.

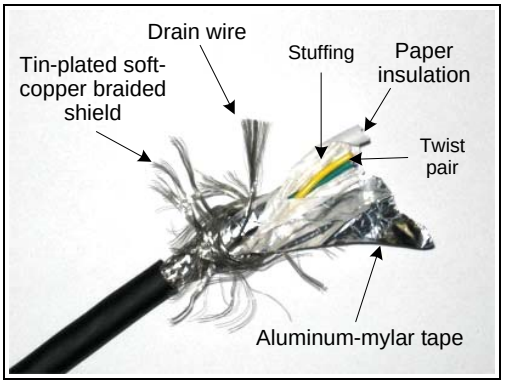


(3) Preparing a connector-cable set (using a flexible cable and a YHLS communication connector to a slave unit)

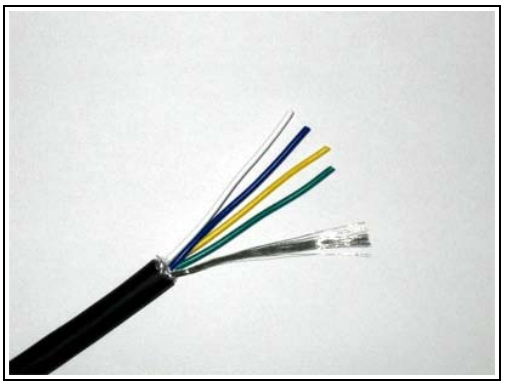
(1) Peel off about 60-mm length of outer vinyl insulation from the cable.



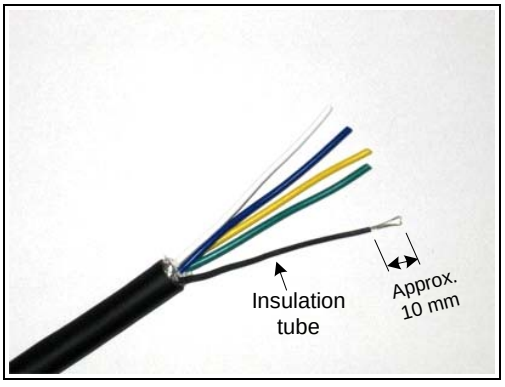
(2) Remove the exposed tin-plated soft-copper braided shield, aluminum-mylar tape, paper insulation, and stuffing. Take care not to damage the exposed drain wire.



(3) Straighten the exposed twisted wires.

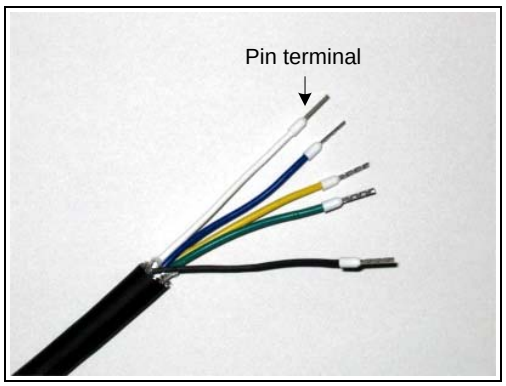


(4) Apply an insulation tube onto the drain wire and shrink the tube with a heat gun.

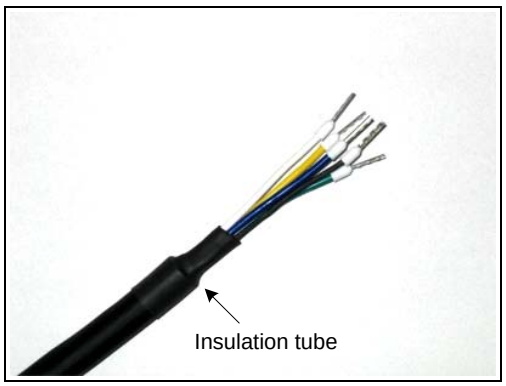


(5) Strip off a sufficient length of the insulation of each wire to allow good electrical contact with a pin terminal. Then put and crimp a pin terminal onto each wire using a crimping tool.

Check that the pin terminal size is compatible with the wire size. Check that each pin terminal is securely crimped to a wire.



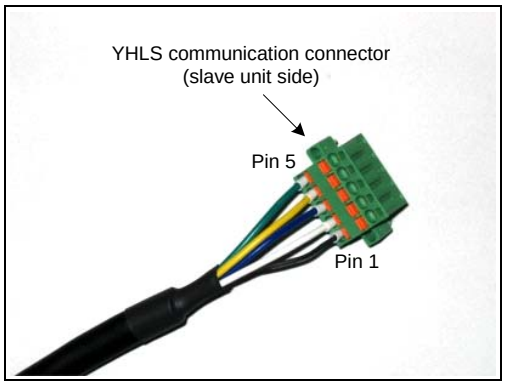
(6) Apply an insulation tube to the cable such that it partially covers both the cable insulation and the exposed wires. Then shrink the tube with a heat gun.



(7) Fully insert each pin terminal into the connector.
Ensure that each pin terminal is securely inserted in the connector.

Pin	Signal Name (slave unit)		Wire Color (KM8□)	
	Full duplex	Half duplex	Full duplex	Half duplex
5	RxD−	NC	Green	-
4	RxD+	NC	Yellow	-
3	TxD−	TRD−	Blue	Blue
2	TxD+	TRD+	White	White
1	SHIELD	SHIELD	Drain	Drain

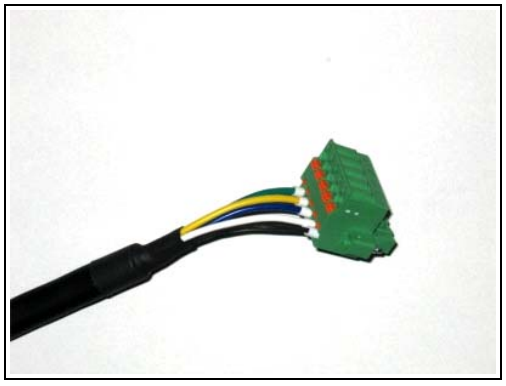
Note: The connector-cable set must become a straight-connection type.



(8) A connector-cable set is completed.

Note: Check the completed connector-cable set for any wrong connection, shorted circuit or open circuit using an ohmmeter or other appropriate instrument.

Note: The connector-cable set preparation procedure is the same for the FMC 1,5/5-ST-3,5-RF connector (for master module) and the TFKC 2,5/5-STF-5,08 AU connector (for slave units). The pictures on the right show the latter case.



FA-M3

YHLS Master Module

IM 34M6H46-04E 1st Edition

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